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# The Impact of the National Minimum Wage on Industry-Level Wage Bargaining in France*

Denis Fougère**, Erwan Gautier*** and Sébastien Roux****

**Abstract:**

This paper examines empirically how industry-level wage floors are set in French industry-level wage agreements and how the national minimum wage (NMW) interacts with industry-level wage bargaining. For this, we use a unique dataset containing about 48,000 occupation-specific wage floors, in more than 340 French industries over the period 2006-2014. We find that the NMW has a significant impact on the seasonality and on the timing of the wage bargaining process. Inflation, past sectoral wage increases and real NMW increases are the main drivers of wage floor adjustments; elasticities of wage floors with respect to these macro variables are 0.6, 0.3 and 0.25 respectively. Wage floor elasticities to inflation and to the NMW both decrease along the wage floor distribution but are still positive for all levels of wage floors.

**Keywords:** minimum wage, collective bargaining, wages.

**JEL Codes:** J31, J51, E24

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# 1. Introduction

Wage setting institutions are often considered as one of the key differences between US and European labour markets. Contrary to the United States, a vast majority of workers in European countries are covered by collective wage bargaining which shapes wage setting within firms.[1] In France, as in many other European countries, unions and employers' associations bargain at the industry level on wage floors for a set of representative job occupations which are specific to the industry. Those wage floors should be higher than the national minimum wage (NMW) which is a legal national wage floor, binding for all workers. To keep wage floors above the NMW, industries may have to update thousands of industry-level wage floors after an increase in the NMW. Those wage floors are then binding for all firms[2] and are used as references for firms' wage policies. Thus, the NMW is not only a floor for all wages but it is also embedded into a complex system of institutions of wage bargaining. Similar patterns are observed in other European countries. A recent and growing body of literature focuses on industry-level wage agreements and how they affect, for instance, Portuguese and Spanish labour market outcomes (e.g. Díez-Catalán and Villanueva, 2014, Martins, 2014, and Guimaraes *et al*., 2015).[3] However, little is known about the determinants of wage floor adjustments and how they interact with NMW increases. In this paper, we investigate how wage floors adjust to shocks in French industry-level agreements by using a large and unique dataset consisting of more than 48,000 job-specific wage floors over the period 2006-2014.

Our first contribution is to open the black box of industry-level bargaining in France and deepen our knowledge of the functioning of wage bargaining institutions that are widespread in Europe.[4] For this purpose, we collect a large and unique new dataset containing all industry-specific scales of wage floors for more than 340 French industries (covering more than 90% of workers of the private sector) over the period 2006-2014. In each industry, wage floors are defined for a specific classification of representative occupations. Those wage floors are then used by firms as a reference to set their wages: Luciani (2014) obtains that industry level is the

[1] For instance, using Belgian data, Lopez-Novella and Sissoko (2013) find that wage increases contained in industry-wage agreements are, on average, fully passed on to actual wages. Using French data, André (2012a) and Combault and Naouas (2015) show that actual wages are positively affected by wage floor changes.

[2] Industry-level agreements are quasi automatically extended to all employees in an industry (see Villanueva, 2015, for a survey on extension procedures in Europe) and firms cannot opt out of industry-level agreements.

[3] Magruder (2012) also reports similar institutional features of wage bargaining in South Africa and finds that centralised bargaining has a negative effect on employment.

[4] See Visser (2013) and Boeri (2015) for a detailed description of European features of wage bargaining.

dominant level in the wage setting process for one third of French firms[5] whereas André (2012a) finds a significantly positive short-term elasticity of actual wages to wage floors (higher than the one associated with the NMW). In our dataset, we are able to observe for several years a wage floor associated with a given occupation within the industry-level job classification, which allows us to compute the size of wage floor adjustments between two wage agreements for this occupation. Overall, our dataset contains more than 48,000 wage floors for more than 6,000 different occupations defined in industry agreements. Our paper provides new stylised facts on how industry wage floors are adjusted in France. We first find that the frequency of wage floor adjustments is highly time- and duration-dependent: industry-level wage agreements are much more frequent during the first quarter of the year and the usual duration between two wage agreements (and so, between two wage floor adjustments) is one year. The frequency of wage floor adjustments is also positively affected by variations of macro variables such as inflation and the growth rate of aggregate wages. Concerning the size of wage floor adjustments, we provide evidence that past inflation plays a key role in explaining the size of wage adjustments. Industry-specific shocks contribute to wage floor increases provided that NMW or inflation increases are not binding. Our paper contributes to the empirical literature examining the extent to which the level of wage bargaining shapes firms' wage adjustment in different European countries (see Card and de la Rica, 2006, for Spain, Cardoso and Portugal, 2005, for Portugal, Gürtzgen, 2009, for Germany, Hartog *et al.*, 2002, for the Netherlands, and Plasman *et al*., 2007, for a comparison between three European countries). However, the level of wage bargaining is often considered to be exogenous and few details are available on the content of wage agreements. Another strand of the literature looks at the determinants of firm-level agreements in Canada and in the United States, emphasizing the role played by inflation or indexation clauses on bargained wage adjustments (see, for instance, Christofides and Wilton, 1983, Christofides and Stengos, 2003, Rich and Tracy, 2004 and Christofides and Nearchou, 2007). Our contribution is to focus on a European country and to provide new results on wage floor adjustments contained in industry-level wage agreements.

Our second contribution is to investigate the interactions between NMW adjustments and the setting of industry-level wage floors. A large strand of literature examines the effects of the NMW either on other wages or on employment (e.g. Card and Krueger, 1995 or Neumark and Wascher, 2008). However, in most European countries, the NMW is not only a minimum wage threshold binding for all workers, it also affects wage bargaining at different levels and, in

[5] 50% of firms with less than 250 employees.

particular, industry-specific wage floors which then shape individual wage adjustments within firms. Here, our contribution is to investigate the spillover effects of the NMW on bargained wage floors which are industry- and occupation-specific. France is an interesting case study since a large share of the labour force is directly affected by NMW increases (between 10 and 15% versus less than 5% in most European countries; see, e.g. Du Caju *et al*., 2009). Several empirical studies find that minimum wages have spillover effects on other wages[6] (see, for instance, Grossman, 1983, Card and Krueger 1995, Machin *et al.*, 2003, Dickens and Manning, 2004, Neumark and Wascher, 2004, Gregory, 2015, Autor *et al.*, 2016). From a theoretical point of view, NMW spillover effects can act through three different channels: first, firms that used to pay higher wages to attract better workers (from low-wage firms) are forced to increase their wages to keep on hiring workers (Manning, 2003); second, firms should raise wages of high-wage workers to prevent them from reducing their effort and to maintain the wage hierarchy within the firm (Grossman, 1983); third, after a NMW increase, if skilled and unskilled workers are substitutes, the labour demand of skilled workers shifts to the right, which results in higher wages for skilled workers. In France, one important channel of transmission of NMW increases to other wages may come from industry-level wage agreements.[7] By law, wage floors cannot be set below the NMW. After a NMW increase, industries have to bargain over new values of wage floors to keep the lowest wage floors above the NMW. For higher wage floors, unions and employers may want to maintain some wage differentials between workers because of fairness or efficiency wage arguments. To assess the impact of the NMW on wage floors variations, we use a Tobit model to disentangle the effect of the NMW increase on the frequency of wage agreements and on the size of wage floor adjustments. However, NMW increases as well as inflation are by definition not industry-specific but macro variables, which raises an identification issue. Since industries bargain on wages infrequently, we assume that bargaining parties incorporate into their updated wage floors, not the change in macro variables at the date of agreement, but rather the cumulated changes in macro variables since the last wage agreement. By considering the cumulated change in the macro variables since the last agreement, we are able to widen the support of the distribution of changes in macro variables, which should help us to identify their effects on wage floors (since cumulated variations are

[6] According to some survey data, about 50% of French firms report in 2010 that NMW increases are one of the most important criteria for adjusting wages in their firm (Luciani, 2014). See also Goarant and Muller (2011) for evidence of NMW spillover effects on wages in France.

[7] Using experimental data, Dittrich *et al.* (2014) show that wage bargaining is an additional channel through which NMW spillover effects might arise, whereas Dolado *et al.* (1997) provide some evidence of spillover effects of sectoral bargained minimum wages on earnings in Spain.

now industry-specific). Our main results are the following. First, we find that the NMW has a significant and positive effect on the frequency of wage agreements: *i)* we observe that most of wage agreements are clustered around the usual date of the NMW adjustment and that the timing of industry-level wage agreements is changed by the date of the NMW increase; *ii)* we also find that industries are much more likely to sign a new wage agreement when at least one wage floor is below the NMW; *iii)* finally, an increase of 1 percentage point (pp) in the NMW (in real terms) raises by 2 to 3 pp the probability of observing a new agreement in a given industry; this effect is higher in industries where a large fraction of workers is paid close to the NMW. The NMW also affects significantly the size of wage floor adjustments. On average, an increase by 1 pp of the real NMW raises by about 0.2 to 0.3 pp wage floors. This elasticity is much larger in industries employing a high proportion of minimum-wage workers. Wage floor adjustments are much more responsive to NMW variations when wage floors are close to the NMW. The impact of the NMW variation decreases along the wage floor distribution but only slowly (from 0.4 for the lowest wage floors to less than 0.15 for the highest ones). Thus the real NMW has a statistically significant effect all along the wage floor distribution.

Our results are also useful to understand why aggregate real wages have been downward rigid in France, in particular during the recent crisis (see, for recent evidence on other European countries, Gartner *et al.*, 2013, and Addison *et al.*, 2015). In France, since 2008, real wages have been increasing at a rate close to 1% per year whereas the unemployment rate has also been rising steadily. An explanation of the small cyclical variations of wages relies on the existence of strong nominal and real wage rigidities which prevent wages from adjusting to shocks in the short run.[8] Here, we investigate the relevance of wage bargaining as one source of potential wage rigidity. Wage bargaining institutions play a role in shaping nominal and real wage rigidity since wage agreements allow firms and workers to incorporate (or not) specific and common shocks into updated wages (see Avouyi-Dovi *et al.*, 2013 for empirical evidence in France). We provide evidence that wage floors present strong downward nominal wage rigidity (there are no nominal wage decreases). Moreover, they also exhibit some degree of real rigidity since decreases of wage floors in real terms are quite rare. Past inflation, industry-specific wage inflation as well as real changes of the NMW are the main drivers of nominal changes in wage floors at the industry level, whereas business cycle conditions and local unemployment rates seem to have a very limited impact on wage floor adjustments.

[8] Le Bihan *et al.* (2012) provide evidence of wage rigidity using French firm-level wage data.

The rest of the paper is organised as follows. Section 2 presents the institutional characteristics of collective bargaining in France. In Section 3, we describe the main stylised facts concerning the adjustment of industry-level wage floors. The empirical model is presented in Section 4 and the results are commented on in Section 5. Section 6 concludes.

# 2. Institutional features of the industry-level wage bargaining in France

Institutions of collective wage bargaining in France are quite similar to those observed in other European countries (see, e.g., Du Caju *et al*., 2009). In particular, wages are bargained at different levels. At the national level, a binding national minimum wage (NMW) is set by the government. At the industry level, employers' organisations and unions bargain on occupation-specific wage floors and firms cannot opt out of an industry-level agreement. At the firm level, employers and unions bargain on wage increases provided that firm-level wages are above industry wage floors (see Boeri, 2015, for a discussion of the effects of such a two-tier bargaining system). This section presents the main institutional features of the wage floor bargaining process at the industry level.

## *2.1. Contractual industries and wage floors*

Firms are classified into different "*contractual industries*" ("*branches conventionnelles"* in French) depending mainly on their activity (possibly combined with a geographical criterion).[9] The definition of a *"contractual industry"* is determined by employers and unions' requests and its existence may depend on historical or geographical reasons. The French Ministry of Labour is in charge of enforcing this system, in particular of ensuring that firms are correctly classified in their actual contractual industry. There are more than 700 different "*contractual industries*" in France. However, just over 300 industries cover more than 5,000 workers and small industries rarely bargain on wages.

For each contractual industry, a general collective agreement ("*convention collective*" in French) defines general rules and principles governing industrial relations between employees and employers within the industry, like wage bargaining, working conditions, duration of working hours, lay-off conditions, union rights, etc. It defines in particular an industry-specific classification of representative occupations; this classification is generally based on many criteria such as worker skills, job requirements, experience, age or qualifications required for

[9] These contractual industries have a different coverage than usual classifications of economic activities (for instance, the NACE classification). Thus they cannot be exactly matched with usual classifications of economic activities.

the job. All workers in the industry are assigned to one position in this job classification. A wage floor is set for every position and workers assigned to a given position cannot be paid below the corresponding industry-specific wage floor.[10] The set of all wage floors is denoted as the industry-level scale of wage floors. We provide some examples of job classification and corresponding wage floors in 2014 for "hairdressing" and for "manufacture of paper and paperboard", in Table 1.

*[Insert Table 1]*

Contractual industries are entitled to bargain on wage floors every year but there is no obligation to come to an agreement at the end of the bargaining process. One important outcome of wage bargaining is the definition of new values for wage floors and the date at which this new scale of wage floors should be enforced. In the absence of any new agreement, wage floors remain unchanged until the next agreement and an agreement does not define any explicit contract duration, as may be the case in other countries like Spain or Sweden. Once an agreement is signed by unions and employers' associations, industry-level agreements cover firms that belong to the employers' organisations that signed the wage agreement. Then, by decision of the Ministry of Labour, industry-level wage agreements can be extended to all firms belonging to the corresponding contractual industry. Those extensions are quasi-automatic and generally quickly implemented. One consequence is that a large majority of workers are covered by industry-level wage agreements.[11] Another consequence is that two different agreement schedules can be considered: a first one corresponding to the signing of agreements, and the other one corresponding to the enforcement of agreements to all firms in a given industry. Finally, contrary to some European countries (like Germany), there is no opt-out possibilities for French firms and industry-level wage floors are binding for all firms in an industry.

## *2.2. Timing and magnitude of wage floor adjustments*

Two margins of wage floor adjustments can be considered: their timing (i.e. the extensive margin) and their magnitude (i.e., the intensive margin). The timing of wage floor adjustments is directly related to the frequency of wage agreements. Industry-level wage bargaining is not a continuous process since it involves the costs of gathering and sharing information and

[10] When this wage floor is lower than the NMW, the latter applies.

[11] Firm-level wage agreements (which usually contain general or occupation–specific wage increases) cover a smaller proportion of workers (about 15%). They are mostly observed in large firms, whereas industry-level agreements are often more binding for smaller firms (Avouyi-Dovi *et al.*, 2013). We do not examine here firm-level agreements.

coordination of unions and employers, for instance.[12] The size of wage adjustments may reflect macroeconomic or sector-specific shocks on different wage floor levels within the same industry. This section presents the main mechanisms linking macro variables and the margins of wage floor adjustments. We focus first on the specific role of the NMW, then we discuss the potential effects of other determinants.

*a) The role of the NMW*

The binding national minimum wage (in French, *SMIC* for *Salaire Minimum Interprofessionnel de Croissance*) is expected to shape the wage floor adjustment process since it defines a legal wage floor for all French workers. NMW increases directly affect wages of about 10 to 15% of workers. The NMW is automatically adjusted every year, on July 1st until 2009 and on January 1st since 2010. This annual frequency of NMW adjustments is expected to induce some synchronisation of industry-level wage agreements around the month of the NMW increase (in particular in low-wage industries) and should affect the extensive margin of wage floor adjustment. NMW increases are decided by the Ministry of Labour following an explicit and legal rule:

$$\Delta \mathrm{NMW}_t = \max(0, \Delta CPI_t) + \frac{1}{2}\max(\Delta \mathrm{W}_t - \Delta CPI_t, 0) + \varepsilon_t \quad (1)$$

where $\Delta NMW_t$ is the NMW increase over the year, $\Delta CPI_t$ is the inflation rate, $\Delta \mathrm{W}_t$ is the increase in blue-collar base wage and $\varepsilon_t$ is a possible discretionary governmental additional increase. Such an additional increase as well as an inflationary shock[13] may induce an unanticipated NMW increase. In such cases, the formula *(1)* is slightly adapted. Over the period 2006-2014, only one discretionary increase (+0.6%) was implemented in July 2012 (just after François Hollande was elected President of the Republique).

The NMW can affect wage floor adjustments through different channels. First, when the NMW increases, it can be set above the lowest wage floors in the industry. By law, all wage floors must then be set above the NMW level, which provides strong incentives for these industries to bargain on wage floors and adjust them accordingly. When industries have all their wage floors above the NMW, they are said to comply with the NMW. When the lowest wage floors fall below the NMW, for instance just after a rise in the NMW, unions and firms' representatives receive strong recommendations from the Ministry of Labour to open industry-level wage

[12] Gray (1978) finds a positive relationship between the length of wage contracts and negotiation costs.

[13] During the year, when the inflation rate is higher than 2% since the last NMW adjustment, the NMW is automatically and immediately adjusted (this was the case in May 2008 and in December 2011).

negotiations and update their lowest wage floors. While compliance with the NMW should mostly affect the decision to reach a wage agreement, the size of the NMW increase should affect both the decision to update wage floors and the size of wage floor adjustments.

Second, wage floors above the NMW might also be affected through spillover effects. Different theoretical explanations may help to rationalise these spillover effects. Manning (2003) shows that if firms used to pay high wages to attract better workers from the low-wage firms, these firms have to increase their wages after a NMW increase if they want to keep on hiring better workers. Using an efficiency wage model, Grossman (1983) shows that after a NMW increase, the wage differential between skilled and unskilled workers becomes smaller and firms have to increase wages of skilled (high-wage) workers in order to avoid a reduction in the effort of skilled workers. A last possible explanation is that a NMW increase may shift the labour demand of relative skilled workers, which results in higher wages for skilled workers. These spillover effects may be heterogeneous because firms cannot uniformly increase all wages after a NMW increase. In this case, NMW increases should result in a lower dispersion of wage floors. These spillover effects will mainly concern the intensive margin of wage floor adjustments.

*b) Other determinants*

Wage floors are set for every occupation in the industry-specific job classification and are constrained by the NMW. These wage floors can be seen as wages that would be set by a representative firm for some representative occupations. So, wage floor adjustments might depend on the usual determinants of wage inflation that are considered in most macro empirical analyses (see Blanchard and Katz, 1999, or, more recently, Gali, 2011, for theoretical foundations), i.e. the inflation rate, the unemployment rate and/or a measure of productivity. However, besides the role played by NMW adjustments, the standard wage inflation equation should be adapted to examine the adjustment of industry-level wage floors for at least two reasons: infrequent wage bargaining and possible interactions between wage floors and actual wages.

First, the wage floor adjustment is not a continuous process over time since it depends on the infrequent signing of an agreement at the industry-level. Hence wage floor changes should be considered with respect to the last date they were changed. Usual determinants of wage adjustments, like inflation or variations in productivity, should also be introduced with respect

to the date of the last wage floor adjustment, and not at a fixed quarterly or annual frequency.[14] Moreover, the usual determinants of wage floor adjustments may also affect the timing of wage agreements. For instance, unions are more likely to ask for opening wage negotiations in periods of high productivity gains.

Second, in standard wage inflation equations, actual aggregate or individual wages are generally considered whereas here we examine industry-level wage floors that could interact with actual wages. In particular, past changes in actual industry-specific wages may affect wage floor updates when they are renegotiated. For instance, a large increase in actual wages in the industry (regardless of the previous wage agreement) could lead unions to adjust wage floors upwards. This adjustment would be rationalised by fairness issues (see Falk *et al.*, 2006). This increase in industry-level wages may be due to productivity gains in the industry but also related to some exogenous wage increases in the largest firms of this industry (determined by a firm-level agreement, for instance). In this case, employers' associations might agree with a wage floor adjustment, in particular if they want to prevent potential competitors from maintaining low wages and obtaining a substantial competitive advantage.

Figure A in Appendix illustrates these two features. The wage floor variations that we consider are variations between two dates of agreement, *t0* and *t1*, since, by definition, wage floors do not change in between. However, determinants of wage floor adjustments, like the NMW or industry-specific wages, can evolve between these two dates. Section 4 will present our empirical strategy to estimate the effects of these variables on wage floor changes, and to deal with identification and potential endogeneity issues.

# 3. Industry wage floors: data and stylised facts

This section describes how we collected and constructed our dataset of wage floors in France. It then provides new stylised facts on industry-level wage floor adjustments.

## *3.1. Data on wage floors*

Our main dataset contains a little more than 48,000 individual bargained different wage floors (defined at the occupational level) in the 345 biggest "contractual" industries (over a little more than 700 industries in France). For those 345 industries, we collected all wage agreements over the period 2006-2014 available on a government website (*Legifrance*).[15] This dataset is to our

[14] For the sake of simplicity, we here leave aside considerations related to anticipated or delayed anticipation of inflation or productivity.

[15] http://www.legifrance.gouv.fr/initRechConvColl.do

knowledge the first one containing such detailed information on wage floors negotiated within industries. Table 2 provides some simple statistics which characterise French "contractual" industries. The number of employees covered by a "contractual" industry varies a lot: in our sample, seven industries cover more than 350,000 employees (for instance, the wholesale food industry, hotels and restaurants, and car services), but 25% of industries cover less than 6,500 employees. Overall, industries in our dataset cover about 12 million employees, i.e., 90% of workers in firms covered by an industry-level wage agreement. Many industries included in our dataset have a national coverage (195 industries). However, in the metalworking industry, wage floors are bargained at the local level: about 74 local different wage scales coexist at the *département*[16] level but they all use the same classification of job occupations. In three sectors 'public works', 'quarry and metal', and 'construction', wage floors are bargained at the regional level (a *région* consists of several *départements*): about 76 regional different wage scales coexist and for each of those 3 sectors job classifications are similar.

*[Insert Table 2]*

The typical wage agreement contains the date (day/month/year) when the agreement was signed, the date at which it is supposed to be enforced,[17] the name of unions that have signed the agreement, and the scale of wage floors (corresponding to wage floors for all occupations in a given industry). Wage floors can be defined as hourly, monthly, or yearly base wages (gross wages in euro, i.e. excluding employer social security contributions but including employee social security contributions). They exclude bonuses and other fringe benefits. We also exclude wage levels or planned wage increases that are only based either on seniority or explicit seniority indexation rules defined in the agreement.

Each scale of wage floors is specific to a job classification defined at the industry level. Thus the number of wage floors contained in wage agreements can vary across industries. On average, industry-level scales of wage floors contain 21 different wage floors corresponding to different job occupations. The median is 17 (Table 2). The average wage gap between two wage floors in a given scale of wage floors is about 5.7%. This average wage differential is much

[16] A *département* is an administrative area. There are 96 *départements* in France. Each of them has approximately the same geographical size (6,000 km2), but different populations.

[17] There is no explicit definition of a contract duration like in Spain for instance. The new wage floor classification remains the same until the next wage agreement.

smaller in the first half of the wage floor scale (close to 2%) whereas the average differential is about 10% at the top of the distribution.[18]

In our dataset, the average wage floor over the sample period is about EUR 1,850, whereas the average NMW over the same period is close to EUR 1,400. For the year 2011, we are able to compare for each industry the average wage floor and the actual average wage in the same industry.[19] Figure 1 plots the average wage floor and the corresponding average base wage for all industries of our sample. As expected, we observe that average actual wages are above average wage floors, the average wage differential being about 40%. We also find that wage floors and actual average wages are highly correlated across industries, suggesting that wage floors might affect actual wage differences across industries.[20]

*[Insert Figure 1]*

In the rest of the paper, our main variables of interest are a dummy variable $Y_{jt}$ which is equal to one if there is a wage agreement at date *t* in industry *j* (0 otherwise) and a variable $WF_{ijt}$ which is defined as the wage floor corresponding to occupation *i* in industry *j* at date *t*. In particular, we examine $\Delta WF_{ijt}$ which is the log-change in $WF_{ijt}$ for a given occupation between two dates. The time unit is the quarter.

## *3.2. Wage floor adjustments: some stylised facts*

How are wage floors adjusted? First, using our dataset, we are able to compute the aggregate annual growth rate of wage floors stipulated by industry-level wage agreements. For that purpose, we calculate the year-on-year wage change for each wage floor ($\Delta WF_{ij}$ for occupation *i* in industry *j*) over the sample period (at a quarterly frequency). We then use information on the number of employees in all industries to obtain an aggregate weighted measure of the year-on-year growth rate of wage floors.[21] Figure 2 plots the average annual growth of wage floors

[18] The top of the wage floor scale consists of wage floors above the median of wage floors in a given job classification.

[19] This information is calculated and published by the Ministry of Labour. See http://travail-emploi.gouv.fr/etudes-recherches-statistiques-de,76/statistiques,78/salaires-et-epargne-salariale,86/conventions-collectives-de-branche,2126/conventions-collectives-de-branche,14576.html.

[20] Using firm-level wage data and information on industry-level wage agreements, André (2012b) reports similar correlations and after controlling for some individual characteristics, she finds higher correlations for wages of blue- and white-collar workers and for wages in small firms.

[21] The number of employees associated with each wage floor of the wage floor scale are calculated using the industry-specific distributions of actual wages and different assumptions on the link between actual wages and wage floors. Results are robust to the different assumptions examined.

which lies between 1.5% and 2.7% (1.8% on average over the period). When we compare it to the overall base wage increase published by the Ministry of Labour, the aggregate wage floor increase is close to but below the aggregate base wage change (2.1% on average) since actual wage changes may also include firm-level and individual wage increases. Second, aggregate variations of wage floors are also quite correlated to the actual aggregate wage increase (the correlation coefficient is close to 0.9). Third, in real terms, the aggregate wage floor increase is +0.4% on average while the output gap has been negative since 2008; this positive real growth of wage floors is mainly driven by low inflation periods. Lastly, there is a correlation between the annual growth of wage floors and NMW variations. In particular, when the NMW increased by more than 2% in 2008 and 2012, the gap between the annual growth of wage floors and the actual aggregate wage growth fell to close to 0.

*[Insert Figure 2]*

Our data on wage floors and wage agreements allow us to decompose the aggregate adjustment of wage floors into an extensive margin of adjustment (the frequency of wage agreements) and an intensive margin (the size of wage floor adjustments contained in wage agreements). We provide here some stylised facts on these two margins of wage adjustment.

First, we consider the extensive margin of adjustment (i.e. the frequency of wage agreements and the duration between two agreements). Over our sample period, a little less than 75% of workers are covered each year by a new industry-level wage agreement, whereas 77% of workers are concerned by the enforcement of a new wage floor scale. This proportion varies slightly over time. In Figure 3, we report the share of workers covered each year by a new wage agreement or by the enforcement of a new wage agreement. This proportion is quite correlated with inflation.

*[Insert Figure 3]*

Another striking feature is that the frequency of wage agreements is strongly seasonal. In Figure 4, we report the share of wage agreements that are signed in each quarter of the year. Over the period 2007-2014, two thirds of industry-wage agreements are signed during the first or the last quarter of the year. If we look at the date of enforcement of wage agreements, seasonal patterns differ somewhat. About 50% of wage agreements are enforced during the first quarter of the year, a little less than 20% in Q2 and Q3 and about 10% in Q4. This seasonality of wage bargaining can be related to NMW adjustments. As discussed in section 2, a reform of the timing of the NMW adjustments was implemented in January 2010: the month of the usual

NMW adjustment was then moved from July to January. We find that the seasonality of wage agreements has been changed by this reform: before 2010, most wage agreements were signed in the third and fourth quarters (23 and 38% respectively of all wage agreements) whereas since 2010, wage agreements are more frequent during the first quarter (41% of all wage agreements). The impact of this reform is even stronger on the seasonality of enforcement dates: before 2010, 26% of wage agreements were implemented during the third quarter whereas after 2010, most enforcement dates of wage agreements occurred in the first quarter (about 60%) and less than 10% in the last quarter of the year. This seasonality reflects the relevance of the NMW adjustment date when examining the timing of industry-level wage bargaining. The usual date of the NMW adjustment changes the timing of industry-level wage agreements.[22]

*[Insert Figure 4]*

The timing of wage bargaining is also related to compliance of industry-level scales of wage floors with the NMW: industries are more likely to update their wage floor scales when their lowest wage floors are below the NMW. Figure 5 plots the proportion of industries having at least one wage floor below the NMW over time, the frequency of wage agreements and the NMW increases. On average, the proportion of industries having at least one wage floor below the NMW is about 30%[23] with large time variations. As expected, large NMW increases (for instance, in 2007, 2008 or 2012) are associated with increases in the proportion of industries with wage floors below the NMW. However, increases in the frequency of wage agreements are also associated with decreases in the non-compliance rate. In particular, before 2010, the non-compliance rate increased in July (namely, when the NMW was adjusted) and then decreased in January when industries signed new wage agreements. After 2010 these two opposing developments cancel each other out since both NMW increases and wage agreements occurred mostly in January, which leads to smaller time variations of the non-compliance rate (except in July 2012 which corresponds to a discretionary increase in the NMW).

*[Insert Figure 5]*

The seasonal effects also reflect the existence of a fixed duration between two negotiations, equal to one year. In France, wage agreements generally do not contain any explicit definition of the contract duration: a wage floor classification is not changed until the next agreement.

[22] This seasonality may have significant consequences at the aggregate level. For instance, using examples in the United States, France or Japan, Olivei and Tenreyro (2007, 2010) find that seasonality of wage contracts changes the size and duration of monetary policy effects.

[23] The average number of wage floors below the NMW is about 3 and the proportion of workers potentially covered by wage floors below the NMW is close to 10%.

Here, instead of the contract duration, we consider the durations either between two successive signing dates of a wage agreement or between two successive dates of wage agreement enforcements. Figure 6 plots the distribution of these durations. 40% of durations between two signing dates of agreements are exactly equal to one year and two thirds of durations lie between 3 and 5 quarters. This partly reflects the legal obligation for industries to bargain on wages every year. Only one fifth of industry wage agreements last more than 5 quarters. Small durations (less than 2 quarters), which represent 12% of all durations, are mostly observed in 2008 and 2012 when the NMW was adjusted twice in the same year (because of inflation in 2008 and a government decision in 2012). Some industries may have signed wage agreements to update their lowest wage floors in response to the NMW increase, as mentioned in section 2. When we consider the duration between two successive dates of wage agreement enforcement, the pattern is similar, except for a peak at 6 months (15% of durations) due to multiple wage increases (stipulated in a given agreement) within a year. There is no industry-level wage contract with durations of several years, as it is the case in other European countries like Sweden or Spain for instance (Du Caju *et al.*, 2009).

*[Insert Figure 6]*

We then provide evidence on the size of wage floor adjustments contained in industry-level wage agreements. In Table 3, we report simple statistics on wage floor changes contained in industry-level wage agreements (by year). The median wage floor increase goes from 1.1% in 2014 to 2.4% in 2008. If we divide the increase by the duration since the last wage agreement, this median now ranges from 1.1% to 2.5%. Variations over time are quite correlated with the aggregate average inflation rate. Note also that the variations of the average duration between two successive agreements is consistent with the over-time variations in the frequency of wage agreements (Figure 3).

*[Insert Table 3]*

Figure 7 reports the distribution of individual wage floor adjustments stipulated by industry agreements year by year. First, there is no nominal wage decrease in industry wage agreements. Second, the peak at zero corresponds to industries where there is either no agreement or where some wage floors are not changed; this peak is very close to the percentage of industries where no agreement is signed (Figure 3). Third, these distributions exhibit some peaks exactly equal or close to the NMW increase or to past inflation, revealing some real rigidity of wage floors. For instance, in 2011, we observe two peaks in the distribution, at 1.5 and 2%, while the NMW

increase in 2011 was about 1.5% and inflation was 2%. During the recent low inflation period, the distribution of changes is much less dispersed. In 2014, there is a peak in the distribution at 1% which corresponds to the NMW increase in 2014 (the inflation rate was about 0.5%).

*[Insert Figure 7]*

# 4. An empirical model for wage floor adjustment

Our aim is to investigate empirically the main determinants of industry-level wage agreements and wage floor adjustments. These determinants include inflation, NMW increases, overall sectoral wage increases and variables capturing productivity shocks or business cycle position (as mentioned in Section 2).

## *4.1. Identification issues*

We first address two important identification issues: the lack of individual variations of some variables which are macro variables and potential collinearity among them.

Our aim is here to assess the effect of some variables (NMW or inflation variations) that are by definition not industry-specific but macro. Thus, the identification of the impact of such variables relies only on their temporal variability. In our model, industries bargain on wages infrequently. Consequently, we can expect that bargaining parties (workers' unions and employers' associations) incorporate into the updated wage floors, not the change in macro variables at the date of agreement, but rather the cumulated changes in macro variables since the last wage industry agreement. Using the cumulated changes in macro variables since the last wage agreement allows us to widen the support of the distribution of changes in macro variables. This strategy should help us to identify the effects of macro variables on wage floors since cumulated variations are now industry-specific. This line of reasoning is valid for the NMW but also for the consumer price index or sectoral actual wages for which we also consider log-variations between two successive wage agreements.

Another identification issue stems from potential collinearities among macro variables. This might be particularly true for inflation and NMW increases: an increase in the inflation rate has a mechanical positive impact on the NMW increase since the formula used to adjust the NMW incorporates past inflation. Reciprocally, part of the effect of inflation might stem from NMW increases. A similar issue may arise from the correlation between inflation and industry-specific wage variations. We thus consider a model in which all macroeconomic variables are taken in real terms in order to isolate the specific effect of inflation. Secondly, the growth rate of industry-specific wages is taken, in real terms, with a lag of one quarter to control for a potential

simultaneity bias. However, this variable may also capture the pass-through of the NMW into industry actual wages (through individual wage increases or firm-level agreements). To control for this, we introduce as covariates the cumulated wage increase in a given industry in real terms and we control for the possible NMW spillover effects.[24] Here again, the aim of this variable transformation is to isolate the specific impact of each macro variable.

## *4.2. The empirical model*

The estimated model is a Tobit-II type model which takes into account the discretionary process of wage bargaining. The first equation corresponds to a Probit model where the dependent variable is a dummy variable equal to one if there is a wage agreement in industry *j* at date *t*, 0 otherwise. Our baseline Probit model can be written as follows:

$$Y_{jt}^{*} = \alpha + \beta\Delta_{j,\tau_j}\pi_t + \gamma\Delta_{j,\tau_j}NMW_t + \delta\Delta_{j,\tau_j-1}\overline{W}_t + \theta\Delta_{j,\tau_j-1}\widetilde{W}_{jt} + \varphi u_{jt} + \omega y_{jt} + \mu x_{jt} + \rho\tau_j + \lambda_t + \varepsilon_{jt} \quad (2)$$

If $Y_{jt}^{*} > 0$ then $Y_{jt} = 1$, otherwise $Y_{jt} = 0$.

where $Y_{jt}$ is a dummy variable equal to one if a wage agreement is signed in industry *j* at date *t* (date in quarter/year format), $\Delta_{j,\tau_j}\pi_t$ is the cumulated inflation since the last wage agreement, $\Delta_{j,\tau_j}NMW_t$ denotes the cumulated NMW increase (in real terms) since the last agreement signed in industry *j* ($\tau_j$ being the elapsed duration between these two agreements in industry *j*), $\Delta_{j,\tau_j-1}W_{jt}$ is the cumulated wage increase in industry *j* since the last wage agreement (minus 1 for limiting the potential simultaneity bias).This last variable is taken in real terms and net of NMW spillover effects. It is decomposed into an aggregate wage increase common to all industries $\Delta_{j,\tau_j-1}\widetilde{W}_{jt}$ (which should be close to the aggregate base wage increase in France) and an industry-specific wage increase (which is calculated as $\Delta_{j,\tau_j-1}\widetilde{W}_{jt} = \Delta_{j,\tau_j-1}W_{jt} - \Delta_{j,\tau_j-1}\overline{W}_t$). Moreover $\tau_j$ denotes the elapsed duration since this last wage agreement (we include three dummy variables corresponding to durations equal to 6 months, one year and two years), $x_{jt}$ a dummy variable capturing the compliance of wage floors with the NMW (this variable is equal to one if at least one of the industry-level wage floors is below the NMW just before the industry-level wage agreement, 0 otherwise), $u_{jt}$ is a measure of the local unemployment rate,

[24] To obtain a broad estimation of the spillover effects of the NMW on industry wages, we estimate an OLS equation relating industry wage increases to NMW increases and inflation. Estimated coefficients are close to 1 for inflation and 0.5 for the NMW.

$y_{jt}$ is a measure of the industry-level output gap and $\lambda_t$ are quarter or time fixed effects. We introduce interaction terms between quarter fixed effects with the dummy variable indicating whether date *t* is before or after January 2010.[25]

Wage indices are not available at the "contractual" industry level. To construct $W_{jt}$, we use hourly wage indices for blue-collar workers and for all workers at the sector-specific level (90 sectors, using the NACE statistical classification; source: French Ministry of Labour) and we compute the average weighted wage index corresponding to each contractual industry by using the employment sectoral structure of "contractual" industries. By construction, these industry-specific wage indices are corrected for composition effects and they reflect the average wage increase in a given industry. To obtain industry-specific measures of unemployment, we use local unemployment rates (at the local labor market level ("*zone d'emploi*" source: Insee, Paris) and the geographical employment structure of industries. We then compute an industry specific measure of unemployment as the weighted average unemployment rate. For the industry-level output gap measure, we use sectoral statistics on sales ("*indices de chiffres d'affaires*"; source: Insee), and we compute average weighted sales indices corresponding to each contractual industry by using the employment structure of conventional industries. We then calculate the industry-specific output gap as the difference between the industry-specific sales index and its linear trend.

The second equation of the Tobit model relates wage floor increases to macro variables such as inflation, the NMW increase (in real terms) and the industry-level actual wage increase (in real terms, net of NMW spillover effects) since the last wage agreement. This second equation is as follows:

$$\Delta_{j,\tau_j} WF_{ijt} = a + b\Delta_{j,\tau_j}\pi_t + c\Delta_{j,\tau_j} NMW_t + d\Delta_{j,\tau_j-1}\bar{W}_t + e\Delta_{j,\tau_j-1}\tilde{W}_{jt} + fu_{jt} + gy_{jt} + hMR_j + v_j + L_t + u_{jit} \qquad (3)$$

where $\Delta_{j,\tau_j} WF_{ijt}$ is the change in the bargained wage floor in occupation *i* and industry *j* between two successive dates (duration $\tau_j$ is measured in quarters). Most of the independent variables are the same as in the first equation but, using estimates obtained in the first equation, we also calculate a Mills ratio which is specific to each industry and which is denoted $MR_j$. Finally,$v_j$ is an industry fixed effect and $L_t$ are date controls.

[25] Recall that January 2010 is the date at which the reform modifying the adjustment date of the NMW increase was implemented (moving from July to January).

In our dataset, wage floor scales are specific to each industry and the number of bargained wage floors can be very different across industries. This raises a technical problem since an industry with a very precise job classification will be oversampled (because of its many job categories). To control for this issue, we define ten wage categories defined by the ratio of each wage floor to the NMW (wage floors less than 1.01*NMW, wage floors between 1.01 and 1.03*NMW, wage floors between 1.03 and 1.07*NMW, wage floors between 1.07 and 1.13*NMW, wage floors between 1.13 and 1.21*NMW, wage floors between 1.21 and 1.32*NMW, wage floors between 1.32 and 1.48*NMW, wage floors between 1.48 and 1.70*NMW, wage floors between 1.70 and 2.09*NMW, wage floors above 2.09*NMW). These thresholds are chosen so that the resulting wage categories contain approximately the same number of wage floors. In each category, we select randomly only one wage floor for each industry.[26] The sample then consists of a little more than 17,000 observations (industry × wage category × date) over about 48,000 wage floors. Moreover, we consider specifications where the NMW effect can vary with the wage floor level. For this purpose, we interact the cumulated NMW variable with dummy variables corresponding to each wage category.

The identification of the model comes from an exclusion restriction: we here assume that quarter effects, dummy variables for duration equal to six months, one year and two years, and the dummy variable indicating that "all wage floors in an industry comply with the NMW" (i.e. the compliance with the NMW) only affect the timing of industry-level wage bargaining process and not the size of wage floor adjustments. These variables, which may be related to negotiation costs or legal constraints, should not affect directly the size of the wage changes. The Tobit model is estimated using a two-step estimation procedure and standard deviations of estimators are obtained using block bootstrap simulations by industry. This method ensures that we can obtain consistent estimates of the standard errors that account for the potential correlation between wage floors within the same industry.[27]

# 5. Results

This section reports the results of our estimations.

[26] Robustness checks have been run using the whole dataset and results remain quite similar.

[27] This method was preferred to direct clustering to deal with the Tobit model structure.

## *5.1. Frequency of industry-level agreements*

Tables 4 and 5 report marginal effects of Probit models in which the dependent variable is either a dummy variable for the signing of a wage agreement or a dummy variable for the enforcement of a wage agreement (when the agreement comes into effect), respectively. We run three different specifications: the first one includes quarter and year dummies as time controls (to capture seasonality in the frequency of wage agreements); the second includes dummy variables by date (our baseline regression) and the last one excludes the dummy "non-compliance with the NMW" (in order to assess the overall effect of the NMW on the frequency of wage agreements).

*[Insert Table 4]*

First, even after controlling for macro variables, duration effects remain quite substantial and statistically significant: the probability of signing a wage agreement after exactly one year is higher by about 31 percentage points (in all specifications). This effect is substantial since the average frequency of agreement signing by quarter is about 20%. A similar but smaller effect (about 15 pp) is obtained for wage agreements signed after exactly two years. This reflects the strong time dependence of wage agreement signing, which might be due to important negotiation costs and may also be related to the obligation for each industry to bargain on wages every year.

*[Insert Table 5]*

Quarter effects are other important factors contributing to the variations in the probability of wage agreement signing. If we consider the first specification where we include year and quarter dummies as time controls, estimates of quarter effects are almost all significant. Before 2010, the differences between quarters are not as strong as those estimated after 2010: before 2010, the probability of signing a wage agreement is somewhat lower in the second quarter (about -5 pp) whereas since 2010, the signing of wage agreements is much more frequent in the first quarter (about +7 pp) and less frequent in the third quarter (-8 pp). The seasonality of agreement enforcements is even more pronounced: before 2010, enforcement of wage agreements is more staggered than after 2010; in particular, the "first quarter" effect almost doubles after 2010 (see Table 5). For the specification where we introduce date dummies as time controls, we plot parameter estimates associated with those dummies on Figure B in the Appendix (the last quarter of 2014 is the reference). We find that before 2010, the signing of wage agreements seems much more frequent in the third and fourth quarters and in the first

quarter after 2010 (an exception is the last quarter of 2012 after the discretionary increase in the NMW in July 2012). The enforcement dates of agreements are staggered before 2010 but quite clustered around the first quarter after 2010. After 2010, all Q1 dates correspond to a higher probability of observing the enforcement of a wage agreement (about +10 pp). As mentioned earlier, this result may be related to the reform of the timing of NMW increases. Supplementary regressions considering industries with a high vs. a low proportion of minimum-wage workers do not show large differences in the schedules of wage agreement signing or enforcements (see Table A in the Appendix). Duration and seasonal effects are consistent with predictions of bounded rationality models:[28] employers and unions may react (and coordinate) to salient and large observable shocks (such as NMW increases which are publicly announced by the government).

In some industries, an increase in the NMW may make it higher than some wage floors, which might exert some specific pressures on these industries to update their wage scales. The dummy variable capturing the compliance of wage floors with the NMW indeed has a positive effect on the probability of signing a wage agreement and on the probability that an agreement will come into force. This effect is greater after 2010 (between 5 to 8 pp) than before 2010. Moreover, the impact of the non-compliance of some wage floors with the NMW is more pronounced for the date of enforcement of agreements than for the dates of signing. This can be explained by the fact that industries update their wage floor scales so that they comply with the NMW when those wage floor scales come into effect. If we exclude this dummy variable, the marginal effect of the cumulated NMW increases by 0.3 to 0.7 pp., suggesting that we capture here a specific channel for the transmission of the NMW increase to the frequency of wage agreements. When considering different types of industries (low versus high proportions of minimum-wage workers), we do not find substantial differences (see Table A in the Appendix).

The NMW may affect directly the probability of a wage agreement since it is an important reference for low-paid workers. Thus, increases in the NMW might have a positive impact on the probability of revising the wage scale. However, the empirical effect of the cumulated real NMW increase on the probability of a wage agreement is found to be rather limited (between 2.5 and 3 pp). This effect is heterogeneous among industries: the impact of a real NMW increase is higher for industries with a high share of minimum-wage workers (between 3.5 and 4 pp)

[28] For instance, Alvarez *et al*. (2011) suggest that when there is a large "information cost" to observe variations of the economic environment, it is an optimal policy to reset prices at discrete pre-set intervals.

than for industries with a low share of minimum-wage workers (between 0 and 2) (see Table A in the Appendix).

Cumulated increases in the inflation rate and in the aggregate base wage have both a greater effect than the real NMW increase on the probability of an industry-level wage agreement. Marginal effects associated with inflation or aggregate base real wages are similar, between 7 and 8 pp (Tables 4 and 5). This result is consistent with the fact that workers are more likely to claim for opening a new negotiation if they observe a higher level of inflation (which reduces the workers' purchasing power) or an increase in average aggregate wages (which might induce a decrease in industry-relative wages). When we consider different types of industries, inflation seems to have a larger effect on the probability of wage agreements in industries with a higher proportion of minimum-wage workers and in metalworking industries (see Table A in the Appendix).

An industry-specific real wage increase seems to have a small and non-significant effect on the probability of a wage agreement and only a small and barely significant effect on the enforcement dates of agreements. This result suggests that industry-specific productivity developments (that would have been captured by this variable) have no impact on the occurrence of signing a wage agreement. Similarly, the sectoral output gap and the local unemployment rate have no significant effect on the occurrence of a wage agreement.

## *5.2. Size of wage floor changes*

Table 6 reports parameter estimates of the second equation of our Tobit model which defines the size of wage floor adjustments. The first column reports results for all industries, the second one for national industries with a high proportion of minimum-wage workers, the third one for national industries with a low proportion of minimum-wage workers and the last one for local metalworking industries (where the proportion of minimum-wage workers is usually very low). All variables are considered in real terms to identify the impact of inflation, and real aggregate base wage variations are corrected from possible NMW spill-over effects, so that the cumulated increase in real NMW will capture the overall impact of the NMW on wage floor adjustments.

*[Insert Table 6]*

First, the Mills ratio has a small but significant negative effect. This negative sign has the following interpretation: if an exogenous shock affects the probability of a wage agreement, it has a negative effect on the size of the wage adjustment, all other observable things being equal.

The most important determinant of the size of wage floor adjustments is the cumulated inflation. The elasticity of wage floor adjustments with respect to cumulated inflation is close to 0.6 (Table 6). This result suggests that wage floors are partly indexed to past inflation. Here, part of this indexation might stem from either a "direct" inflation effect, or from more "indirect" effects resulting either from the NMW indexation to past inflation or from aggregate base wage indexation to past inflation. Our model cannot fully disentangle these two types of effects. The elasticity of 0.6 should be interpreted as the overall impact of inflation on nominal variations of wage floors. Moreover, we find that this degree of indexation to inflation is much larger in industries with a high proportion of minimum-wage workers (elasticity of 0.57) than in industries with a low proportion of minimum-wage workers (0.41). In metalworking industries, there seems to be a strong indexation mechanism since the elasticity of wage floor adjustments to inflation is 0.75.

Second, the cumulated real NMW variation has a positive and significant effect on the size of wage floor adjustments; on average, in a given industry, an increase of 1% in the NMW (in real terms) will increase wage floors by 0.22 pp. When we consider the heterogeneity of this effect across industries, as expected, the NMW has a larger effect on wage floors in industries with a high proportion of minimum-wage workers (elasticity of 0.3) than in industries with a low proportion of minimum-wage workers (elasticity of 0.22), and in metalworking industries where the proportion of minimum-wage workers is close to 0 (elasticity of 0.14). However, in all groups of industries, the effect of the NMW is significant even when the proportion of minimum-wage workers is very low; this result suggests the existence of some NMW spillover effects across industries.

Contrary to what we observe for the occurrence of wage agreements, the cumulative aggregate real wage variation seems to play a limited role on the size of wage floor adjustments. Its effect is significant but small (elasticity of 0.17). Industry-specific real wage variations have a larger impact on the size of wage floor changes, with an elasticity of 0.34. This result would suggest that industry-specific actual wage variations play a role in determining a new scale of wage floors. For instance, sectoral productivity gains that would have been incorporated into sectoral actual wages are also incorporated in the new scale of wage floors at the industry level. Considering the heterogeneity of these effects across industries (Table 6), we observe that the effect of industry-specific wage changes is larger in industries with a low or a very low proportion of minimum-wage workers. The elasticity of wage floor changes with respect to sectoral wage changes is 0.45 in industries with a low proportion of minimum-wage workers

and 0.77 in metalworking industries, whereas it is small and not significant in industries with a high proportion of minimum-wage workers.[29] In the same way, aggregate cumulated wage change plays a larger role in industries with a high proportion of minimum-wage workers than in other industries. This result might suggest that industries where the NMW is less binding have much more leeway to take into account the industry-specific wage or productivity developments. Lastly, the sectoral output gap measure and the local unemployment rate have no significant effect on the size of wage floor changes. This finding suggests that business cycle conditions play a very limited role on industry-level wage adjustment but it might also be due to measurement errors in our proxy for business cycle conditions of "contractual" industries.

*[Insert Figure 8]*

Finally, we test whether the impact of NMW increases varies along the wage floor distribution and examine the NMW spillover effects along this distribution. Table D in the Appendix reports variance decomposition of annual wage growth within and across industries. We find that between 20 and 30% of the total variance is explained by differences across occupations within the same industry, which suggests that there is a substantial differential wage growth across wage floors. Figure 8 reports estimated parameters associated with the variables representing interactions between cumulated real NMW variations and dummy variables capturing the different effects along the wage floor distribution. As expected, these parameter estimates decrease along the wage floor distribution, from 0.4 for wage floors close to the NMW to 0.1 for wage floors above twice the NMW. One interesting result is that the NMW effect is significant all along the wage floor distribution. It decreases quickly from the lowest wage floor to wage floors equal to 1.1*NMW. However, we estimate that NMW real variations have a positive effect on wage floor adjustments for all levels of wage floors.

We then test whether other macro variables have such heterogeneous effects along the wage distribution. We find that only inflation has such a heterogeneous effect. Figure 9 reports elasticities of wage floor variations obtained with respect to both real NMW variations and inflation along the wage floor distribution. In particular, we find that the elasticity of wage floor changes with respect to inflation is very high for wage floors close to the NMW (close to 0.8)

[29] Table C in the Appendix also reports results when we distinguish the firm size composition of industries. We find that industries where the share of small firms is high, the elasticity of wage floor changes with respect to sectoral wage changes is larger, whereas the elasticity with respect to inflation is smaller, although these differences are small. A possible interpretation is that in those industries (where small firms may have a larger bargaining power), sector-specific wage developments play a greater role and large firms cannot use industry agreements to curb competition of smaller firms.

and then decreases steadily (0.6 for wage floors close to 1.1*NMW, about 0.4 for wages above 2*NMW). This elasticity is positive and significant for all levels of wage floors. This decreasing slope is very similar to the one obtained for the NMW.

*[Insert Figure 9]*

Some separate regressions run on different groups of industries (high proportion of minimum-wage workers, low proportion of minimum-wage workers, and metalworking) show some heterogeneity across industries (Figure C in the Appendix). All along the wage distribution, the NMW effect is a little larger in industries with a high share of minimum-wage workers than in industries with a low proportion of minimum-wage workers and in metalworking industries. Moreover, the NMW effect is positive and significant all along the wage floor distribution, not only in industries with a high proportion of minimum-wage workers but also in industries with a low proportion of minimum-wage workers, for instance until wage floors equal to 1.1*NMW in metalworking industries. Concerning the elasticity of wage floor changes with respect to inflation, differences are much larger. This elasticity is close to 1 for low wages in industries with a high proportion of minimum-wage workers and the slope is slightly decreasing towards 0.7 for higher wage floors. A similar pattern appears for metalworking industries with still a high elasticity (close to 0.5) for wage floors above 1.1*NMW. In industries with a lower proportion of minimum-wage workers, the elasticity of wage floors with respect to inflation is close to 0.7 for wage floors close to the NMW and decreases towards 0.3 for the highest wage floors.

We run two other regressions as robustness checks. First, we test whether our results are driven by heterogeneity across industries according to the composition of their wage floor categories (as defined in section 4). For this purpose, we run a regression restricting our sample to industries whose wage classification contains at least 8 of the10 wage categories (more than 60% of industries in our sample). Results are reported on Figure D in the Appendix; results are quite similar to those obtained using all industries, which suggests that heterogeneity is not due to the wage category composition. The largest difference appears for the effect of the NMW which is a little smaller in industries whose wage classification contains at least 8 wage categories (- 0.03 pp on average along the wage floor distribution).[30]

[30] This smaller effect of the NMW in industries with at least 8 wage categories is in particular obtained for industries with a low proportion of NMW workers whereas in industries with a large proportion of NMW workers, the effect of NMW is on the contrary higher (about +0.09 pp all along the wage distribution).

Second, we test whether determinants of wage floor variations differ before and after 2010. For this purpose, we interact macro variables of our Tobit model with a dummy variable "before 2010" and a dummy variable "after 2010". Results are reported in Table B in the Appendix. Elasticities with respect to inflation and with respect to NMW increases are slightly changed whereas the effect of sectoral and average aggregate wage variations are more significantly changed. Before 2010, the industry-specific wage effect dominates the aggregate wage effects (0.6 versus 0.2) whereas after 2010, the impact of sectoral wage variations becomes non-significant for all specifications and for all industries. The aggregate wage effect remains significant but small, especially for industries with a high share of minimum-wage workers. This result might suggest that after 2010 (which also corresponds to a recession and a low inflation period), industry-level wage agreements might be more constrained by indexation and by NMW real increases and they might be less likely to adjust industry-specific wage floors to industry-specific conditions.

# 6. Conclusion

Using a detailed dataset of thousands of industry-level wage agreements in France over the period 2006-2014, this paper provided new evidence on how wage floors are set in industry-level agreements in France.

We showed that the time schedule of wage agreement signing is very seasonal and depends strongly on the duration since the last wage agreement: the duration between two dates of agreement signing is typically one year and industry-level wage agreements are much more frequent in the first quarter of the year. Inflation and sectoral wage increases have also a significant but smaller impact on the probability of signing a wage agreement: a reduction of workers' purchasing power or a drop in industry wages relative to aggregate wages leads to a higher probability of signing a wage agreement. Inflation and past sectoral real wage increases have a larger impact on the size of wage floor increases and elasticities of wage floors to these macro variables are respectively 0.6 and 0.3. We also find that the effect of inflation is heterogeneous along the wage floor distribution: the elasticity of wage floors with respect to inflation is close to 0.8 for the lowest wage floors and then decreases steadily to reach 0.4 for the highest wage floors.

The NMW is another important factor shaping wage-floor setting in industry-level agreements. It affects the timing of wage agreements through different channels: first, the seasonal timing

of wage agreement signing can be partly linked to the automatic and seasonal adjustment of the NMW; second, the signing of a wage agreement is more likely when the scale of wage floors does not comply with the NMW in a given industry; finally, NMW increases have a small but positive impact on the probability of signing a wage agreement. Moreover, the NMW also affects the size of wage floor adjustments: when the real NMW increases by 1%, wage floors increase on average by 0.25%. This elasticity is heterogeneous across industries going from 0.34 in industries with a high proportion of minimum-wage workers to 0.14 in metalworking industries where the proportion of minimum-wage workers is close to 0. The elasticity of wage floors with respect to real NMW variations also decreases along the wage floor distribution but only slowly, from 0.4 for the lowest wage floors to 0.15 for the highest wage floors.

Finally, we provide evidence that wage floors present strong downward nominal wage rigidity since there are no nominal decreases of wage floors. Besides, we also find a large correlation between wage floor adjustments and past inflation or past NMW increases whereas business cycle conditions and local unemployment rates have no impact on wage floor adjustments. These results suggest that bargaining institutions can explain - at least partly - the small response of aggregate real wages to the rise of unemployment during the Great Recession. Further research linking dynamics of wage floors and firm-level wages should help to understand to which extent wage bargaining institutions (including in interaction with the NMW) might shape wage dynamics during the recent crisis.

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**Table 1: Examples of minimum wage scales stipulated by industry-level wage agreements**

a) Paper and paperboard (30,000 workers)

Salaires mensuels minima conventionnels (SMMC)

*(En euros.)*

| NIVEAU | ÉCHELON | COEFFICIENT | SMMC (au 1er mars 2014) |
|---|---|---|---|
| I | 1 | 125 | 1 446 |
| | 2 | 130 | 1 457 |
| | 3 | 135 | 1 469 |
| II | 1 | 140 | 1 489 |
| | 2 | 150 | 1 509 |
| | 3 | 160 | 1 534 |
| III | 1 | 170 | 1 568 |
| | 2 | 185 | 1 601 |
| | 3 | 195 | 1 635 |
| IV | 1 | 215 | 1 782 |
| | 2 | 235 | 1 929 |
| | 3 | 260 | 2 091 |
| V | 1 | 285 | 2 276 |
| | 2 | 315 | 2 508 |
| | 3 | 350 | 2 773 |

b) Hairdressing (100,000 workers)

*(En euros.)*

| NIVEAU | ÉCHELON | CLASSIFICATION | SALAIRE minimal |
|---|---|---|---|
| I | 1 | Coiffeur(se) débutant(e) | 1 470 |
| | 2 | Coiffeur(se) | 1 475 |
| | 3 | Coiffeur(se) confirmé(e) | 1 480 |
| II | 1 | Coiffeur(se) qualifié(e) | 1 500 |
| | | ou technicien(ne) | 1 530 |
| | 2 | Coiffeur(se) hautement qualifié(e) ou technicien(ne) qualifié(e) | 1 620 |
| | 3 | Coiffeur(se) très hautement qualifié(e) ou assistant(e) manager ou technicien(ne) hautement qualifié(e) | 1 740 |
| III | 1 | Manager | 1 895 |
| | 2 | Manager confirmé(e) | 2 270 |
| | | ou animateur(trice) de réseau | 2 680 |
| | 3 | Manager hautement qualifié(e) | 2 840 |
| | | ou animateur(trice) de réseau confirmé(e) | 2 890 |

Notes: "Niveau" is the category of workers, most frequently: "I" for routine task occupations or low-skilled workers, "II" for higher-skilled workers (technicians for instance)… The highest levels usually represent "managers". "Echelons" are sub categories within a category of workers. The "Coefficient" can be used to calculate the wage rate. Classifications of occupations are specific to each industry. The NMW was set at EUR 1,446 in 2014 (Jan. 1st).

**Table 2: Descriptive statistics on industry wage scales**

| | Mean | Q1 | Median | Q3 |
|---|---|---|---|---|
| Number of employees | 34,585 | 6,295 | 12,665 | 30,099 |
| Number of wage levels | 20.73 | 12.00 | 17.00 | 25.00 |
| Average wage floor (in euro) | 1,858 | 1,476 | 1,661 | 2,080 |
| Average wage differential (%) | 5.65 | 3.52 | 5.40 | 7.26 |
| Average wage differential (%) (at the bottom of the wage scale) | 2.05 | 0.35 | 1.00 | 2.98 |
| Average wage differential (%) (at the top of the wage scale) | 9.46 | 5.75 | 8.77 | 11.36 |
| Maximum/minimum wage ratio within an industry | 2.55 | 1.86 | 2.37 | 3.16 |
| Average gross wage / average wage floor (weighted) | 1.408 | 1.340 | 1.382 | 1.477 |

Notes: The "Number of employees" is calculated using the DADS dataset which reports the number of employees in each firm and the "contractual industry" covering the firm. The number of wage levels is calculated as the number of different wage floors reported in wage agreements; the statistics are weighted by the number of employees in industries. The average wage floor is calculated for each industry; then statistics are computed across industries and weighted by the number of employees. The average wage differential is calculated as the log difference (in %) between two successive wage floors in the wage scale of an industry; the average wage difference is computed for each industry. Statistics are then weighted by the number of employees. The average wage differential "at the bottom of the wage scale" is calculated using only the first half of the wage floor scale whereas 'at the top of the wage scale' we use the second half of the wage floor scale. The max/min ratio is calculated as the ratio between the minimum wage floor and the maximum wage floor in a given industry. The "Average gross wage / average sectoral wage" is calculated as the ratio between the actual average gross wage in a given industry (as reported by the Ministry of Labour in 2011) and the average weighted wage floor in the same industry (in 2011). Weighted statistics use the number of employees in each industry.

**Table 3: Average growth rate of wage floors by year**

| Year | Wage floor variations (%) | | | | Duration (in years) | Wage floor variations / duration (%) | Inflation (year-on-year variation, %) (Insee) |
|---|---|---|---|---|---|---|---|
| | Mean | Q1 | Q2 | Q3 | Mean | Median | |
| 2007 | 2.27 | 1.68 | 2.17 | 2.93 | 0.45 | 2.43 | 1.5 |
| 2008 | 2.41 | 1.83 | 2.39 | 3.05 | 0.72 | 2.51 | 2.8 |
| 2009 | 2.01 | 1.19 | 1.5 | 2.83 | 0.68 | 1.97 | 0.1 |
| 2010 | 1.68 | 0.81 | 1.28 | 1.98 | 0.82 | 1.29 | 1.5 |
| 2011 | 1.9 | 1.45 | 1.78 | 2.23 | 1.14 | 1.58 | 2.1 |
| 2012 | 2.03 | 1.62 | 2.09 | 2.37 | 0.94 | 2.09 | 2 |
| 2013 | 1.69 | 1.29 | 1.73 | 2.09 | 1.03 | 1.53 | 0.9 |
| 2014 | 1.34 | 0.99 | 1.1 | 1.42 | 1.13 | 1.1 | 0.5 |

Note: Statistics are calculated using all non-zero wage floor changes over the period 2007-2014. Statistics are weighted using the number of workers by job occupation in the industry specific classification.

**Table 4: Marginal effects of covariates in the Probit model for wage agreement signing**

| Dependent variable - *Dummy variable for a wage agreement signing* | (1) | (2) | (3) |
|---|---|---|---|
| Cumulated inflation | 7.349*** | 7.523*** | 8.424*** |
| | (0.561) | (0.612) | (0.596) |
| Cumulated real NMW | 3.361*** | 2.650*** | 2.906*** |
| | (0.539) | (0.609) | (0.625) |
| Cumulated real aggregate wage change | 6.695*** | 7.496*** | 7.961*** |
| | (0.936) | (1.144) | (1.111) |
| Cumulated real wage change in the industry | 0.884 | 0.823 | 0.903 |
| | (1.715) | (1.727) | (1.763) |
| Local unemployment rate | 0.032** | 0.024 | 0.030 |
| | (0.014) | (0.018) | (0.019) |
| Output gap | -0.259 | -0.021 | 0.066 |
| | (0.308) | (0.344) | (0.342) |
| Duration | | | |
| 6 months | -0.013 | -0.016 | -0.023* |
| | (0.013) | (0.013) | (0.013) |
| 1 year | 0.312*** | 0.311*** | 0.312*** |
| | (0.014) | (0.014) | (0.014) |
| 2 years | 0.144*** | 0.146*** | 0.149*** |
| | (0.032) | (0.033) | (0.033) |
| ***Before 2010*** | | | |
| Q1 | 0.021* | | |
| | (0.012) | | |
| Q2 | -0.047*** | | |
| | (0.009) | | |
| Q3 | -0.016 | | |
| | (0.010) | | |
| Q4 | Ref. | | |
| Non-compliance with the NMW | 0.013* | 0.011 | |
| | (0.008) | (0.008) | |
| ***After 2010*** | | | |
| Q1 | 0.065*** | | |
| | (0.009) | | |
| Q2 | 0.007 | | |
| | (0.007) | | |
| Q3 | -0.081*** | | |
| | (0.006) | | |
| Q4 | Ref. | | |
| Non-compliance with the NMW | 0.057*** | 0.052*** | |
| | (0.007) | (0.007) | |
| N | 9 771 | 9 771 | 9 771 |
| Year / Dates dummies | Year | Date | Date |
| Industry dummies | Yes | Yes | Yes |

Note: This table reports marginal effects estimated with Probit models. Standard errors are obtained using bootstrap methods and are reported in brackets. The dependent variable is the dummy variable equal to 1 if there is a wage agreement in industry *j* at date *t* (quarter-year). Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.1

**Table 5: Marginal effects of covariates in the Probit model for wage agreement enforcement**

| Dependent variable - *Dummy variable for wage agreement enforcement* | (1) | (2) | (3) |
|---|---|---|---|
| Cumulated inflation | 6.856*** | 6.382*** | 8.042*** |
| | (0.607) | (0.687) | (0.698) |
| Cumulated real NMW change | 2.707*** | 2.062*** | 2.692*** |
| | (0.569) | (0.704) | (0.745) |
| Cumulated real aggregate wage change | 7.083*** | 7.953*** | 9.227*** |
| | (0.987) | (1.159) | (1.172) |
| Cumulated real wage change in the industry | 3.893* | 3.664* | 3.978* |
| | (2.070) | (2.091) | (2.213) |
| Local unemployment rate | 0.055*** | 0.019 | 0.023 |
| | (0.013) | (0.017) | (0.017) |
| Output gap | 0.023 | 0.278 | 0.289 |
| | (0.326) | (0.381) | (0.390) |
| *Duration* | | | |
| 6 months | 0.048*** | 0.050*** | 0.048*** |
| | (0.016) | (0.016) | (0.016) |
| 1 year | 0.325*** | 0.325*** | 0.338*** |
| | (0.016) | (0.016) | (0.016) |
| 2 years | 0.155*** | 0.153*** | 0157*** |
| | (0.032) | (0.032) | (0.032) |
| ***Before 2010*** | | | |
| Q1 | 0.069*** | | |
| | (0.012) | | |
| Q2 | -0.046*** | | |
| | (0.010) | | |
| Q3 | 0.014 | | |
| | (0.010) | | |
| Q4 | Ref. | | |
| Non-compliance with the NMW | 0.037*** | 0.033*** | |
| | (0.009) | (0.010) | |
| ***After 2010*** | | | |
| Q1 | 0.127*** | | |
| | (0.011) | | |
| Q2 | 0.018** | | |
| | (0.009) | | |
| Q3 | -0.037*** | | |
| | (0.009) | | |
| Q4 | Ref. | | |
| Non-compliance with the NMW | 0.082*** | 0.075*** | |
| | (0.008) | (0.009) | |
| N | 9 777 | 9 777 | 9 777 |
| Year / Dates dummies | Year | Date | Date |
| Industry dummies | Yes | Yes | Yes |

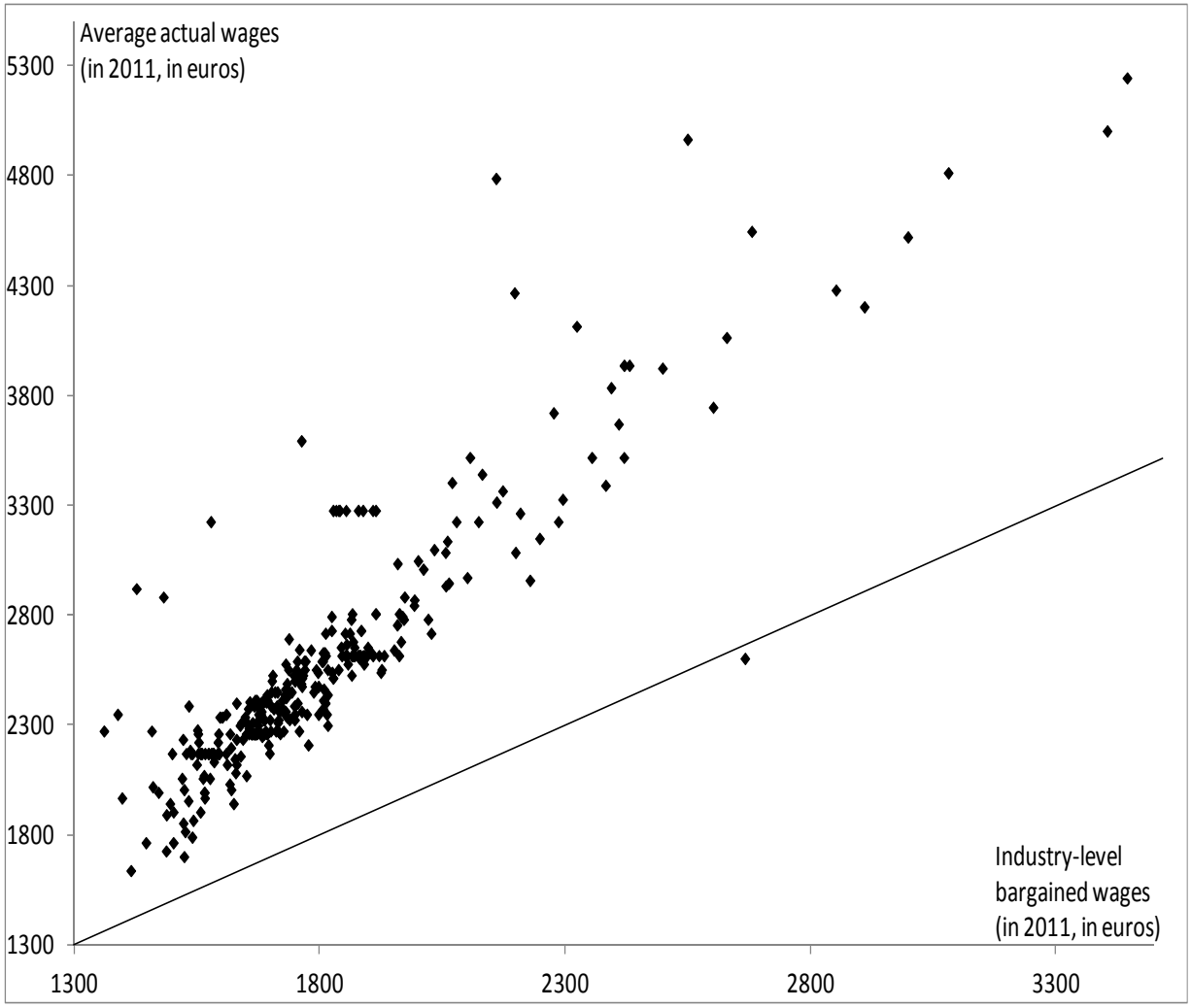
Note: This table reports marginal effects estimated with Probit models. Standard errors are obtained using bootstrap methods and are reported in brackets. The dependent variable is the dummy variable equal to 1 if there is a wage agreement in industry *j* at date *t* (quarter-year). Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.1

**Table 6: Parameter estimates of the Tobit model – Wage floor changes**

| *Dependent variable :* Nominal wage floor changes | All | High prop. of NMW workers | Low prop. of NMW workers | Metalworking |
|---|---|---|---|---|
| Cumulated inflation | 0.590*** (0.038) | 0.572*** (0.058) | 0.408*** (0.068) | 0.749*** (0.061) |
| Cumulated real NMW change | 0.223*** (0.030) | 0.299*** (0.059) | 0.221*** (0.063) | 0.142*** (0.042) |
| Cumulated real aggregate wage change | 0.173*** (0.053) | 0.191** (0.080) | 0.103 (0.112) | 0.143 (0.117) |
| Cumulated real wage change in the industry | 0.338*** (0.125) | -0.119 (0.114) | 0.445** (0.194) | 0.774*** (0.290) |
| Local unemployment rate | 0.000 (0.001) | 0.012*** (0.004) | 0.002 (0.004) | 0.001 (0.001) |
| Output gap | 0.016 (0.015) | -0.026 (0.021) | -0.044 (0.036) | -0.011 (0.047) |
| Mills Ratio | -0.002*** (0.000) | -0.002*** (0.001) | -0.004*** (0.001) | 0.001 (0.001) |
| $R^2$ | 0.595 | 0.545 | 0.586 | 0.660 |
| N | 17 064 | 5,460 | 4,337 | 4,637 |
| Time dummies | Date | Date | Date | Date |
| Industry dummies | Yes | Yes | Yes | Yes |

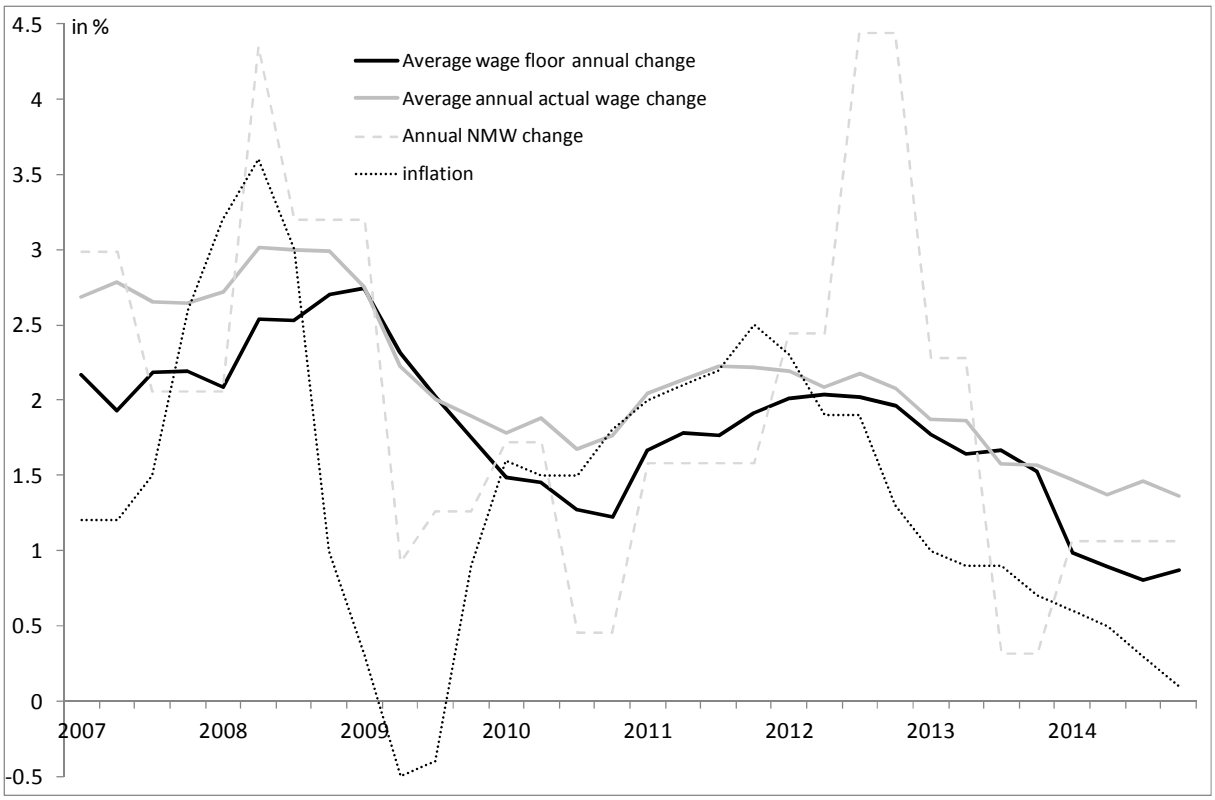
Note: The dependent variable is the nominal (or real) wage floor change between two successive effects of wage agreements in a given industry. Estimates in the column "All" concern all industries in our sample (national coverage industries, metalworking industries (with a local level coverage) and construction and public work industries (regional coverage). Estimates in the column "High prop. of NMW workers" are based on the subsample of industries with a national coverage and with a proportion of minimum-wage workers higher than the median among all industries. Estimates in the column "Low prop. of NMW workers" are based on the subsample of industries with a national coverage and with a proportion of minimum-wage workers smaller than the median among all industries. Estimates in the column "Metalworking" are based on the subsample containing local metalworking industries. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

**Figure 1: Average wage floors versus average actual wages (2011)**



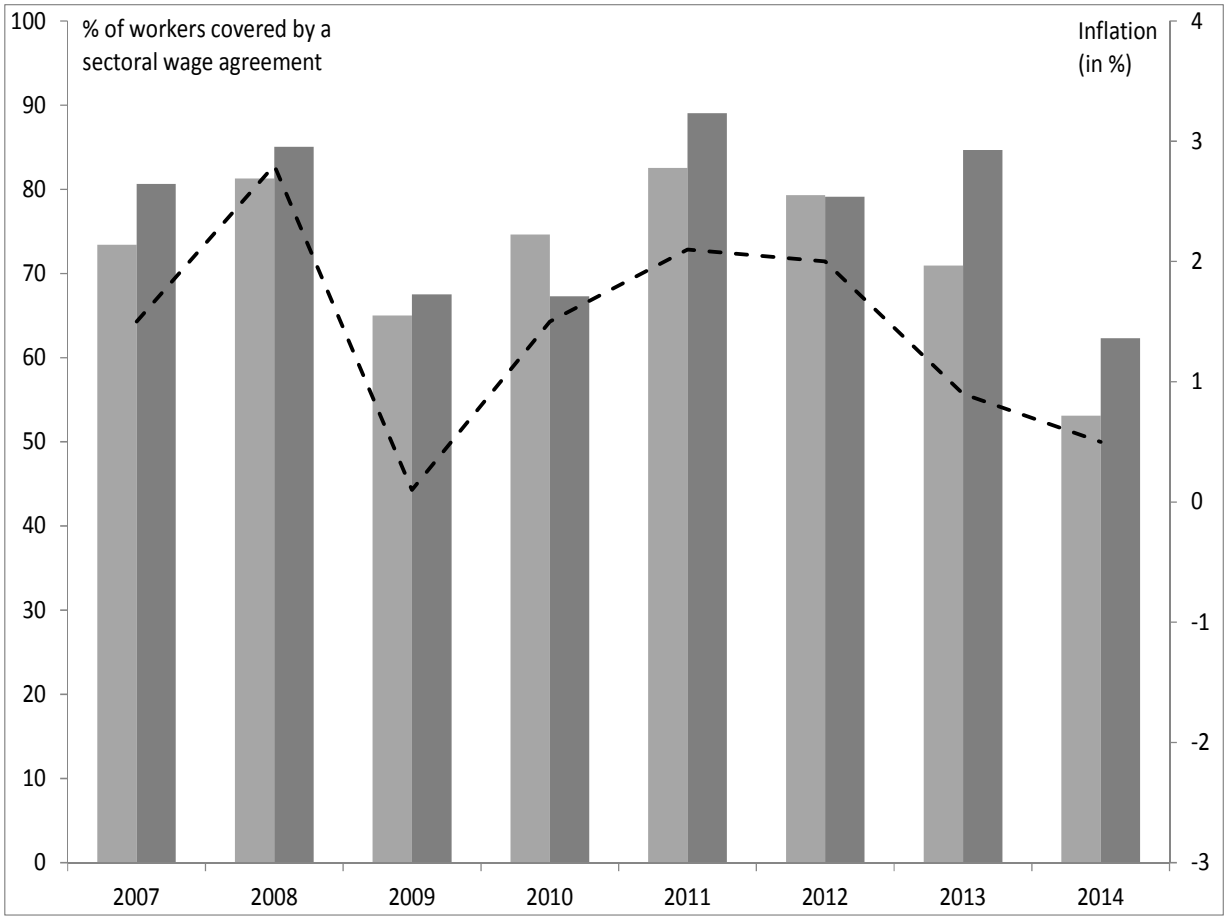

Notes: Actual average gross wages are collected and published by the Ministry of Labour for the year 2011 (in euro). Using our data, we calculate the weighted average wage floor for each industry in year 2011. Each point represents a given industry whereas the dark line is the line $y = x$.

**Figure 2: Average size of wage changes in industry-level wage agreements (2007-2014)**



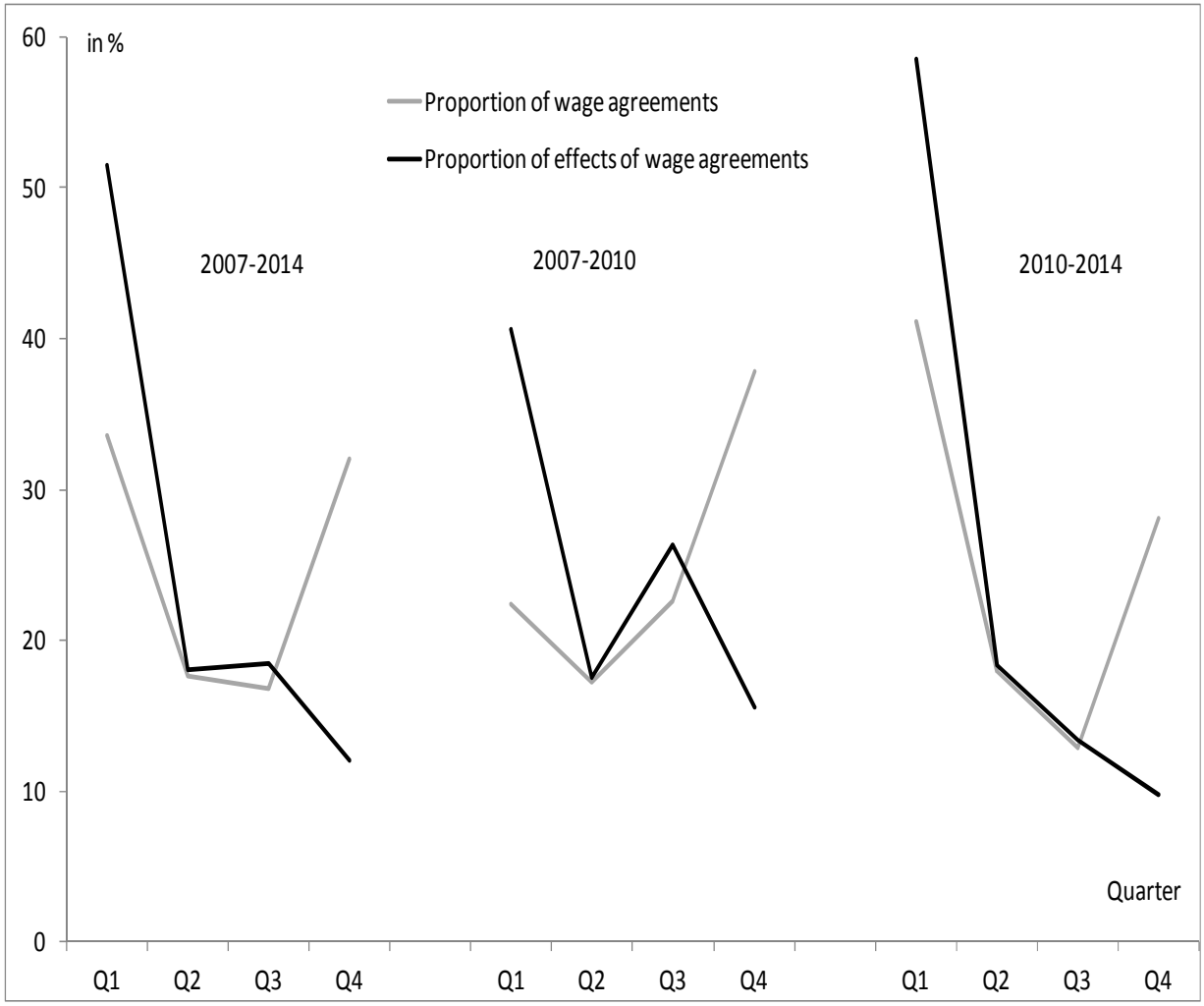

Notes: The average wage increase in industry agreement is computed as a weighted (by the number of employees) average of all wage increases stipulated in industry agreement coming into effect at a given date (year/quarter). The overall wage increase is the annual increase in the aggregate actual wage index (SMB – source: DARES). NMW is the NMW increase at an annual frequency (source: INSEE). Inflation is the overall CPI annual growth (source: INSEE).

**Figure 3: Percentage of workers covered by a new industry-level wage agreement in a given year**



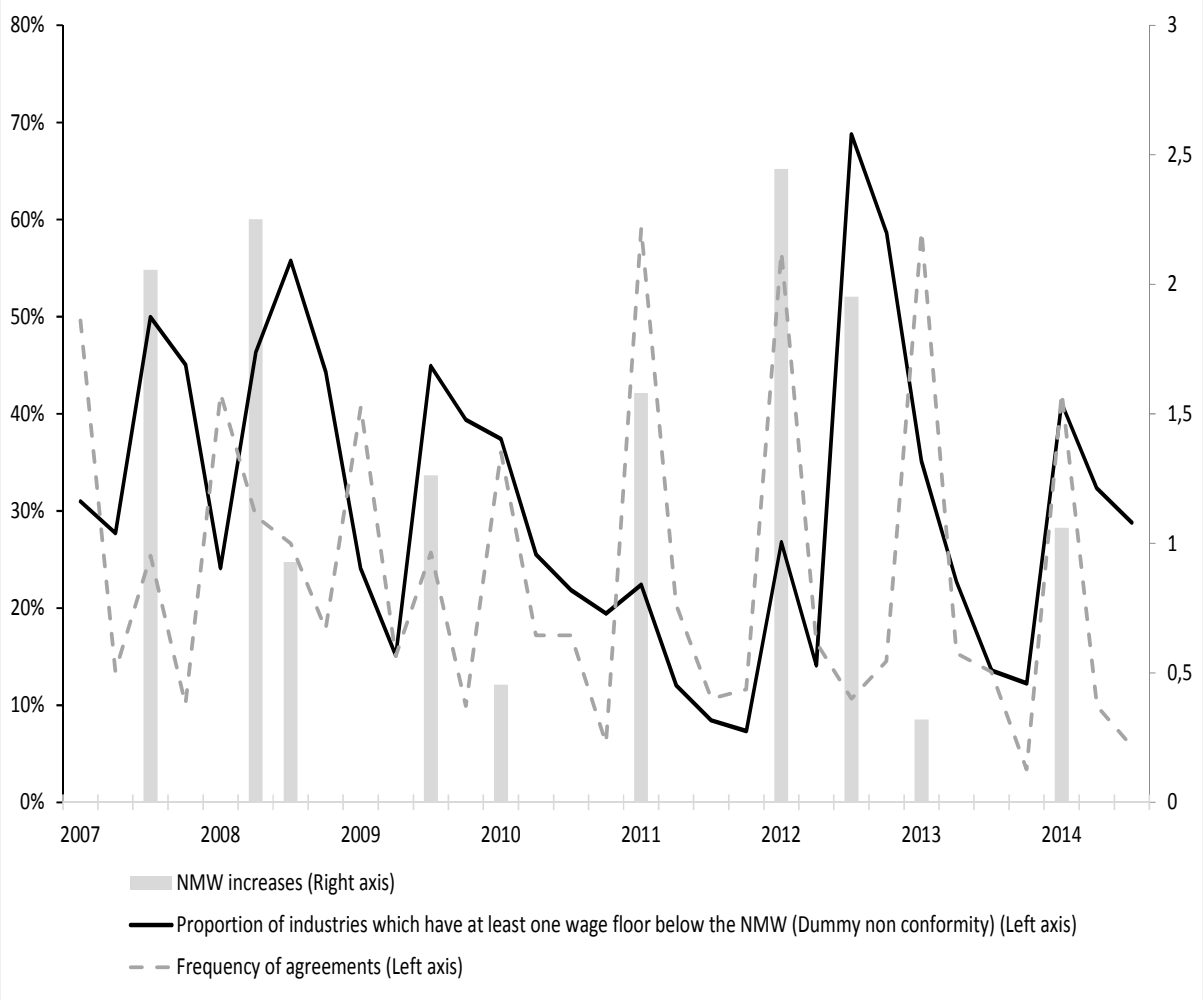

Notes: The light grey histogram is the percentage of industries (weighted by the number of employees) which sign a wage agreement in a given year. The dark grey histogram is the percentage of industries (weighted by the number of employees) in which wage agreements are implemented in the given year. The dotted line is the annual average inflation rate in France (Insee).

**Figure 4: Proportion of industry-level wage agreements (in percent) by quarter**



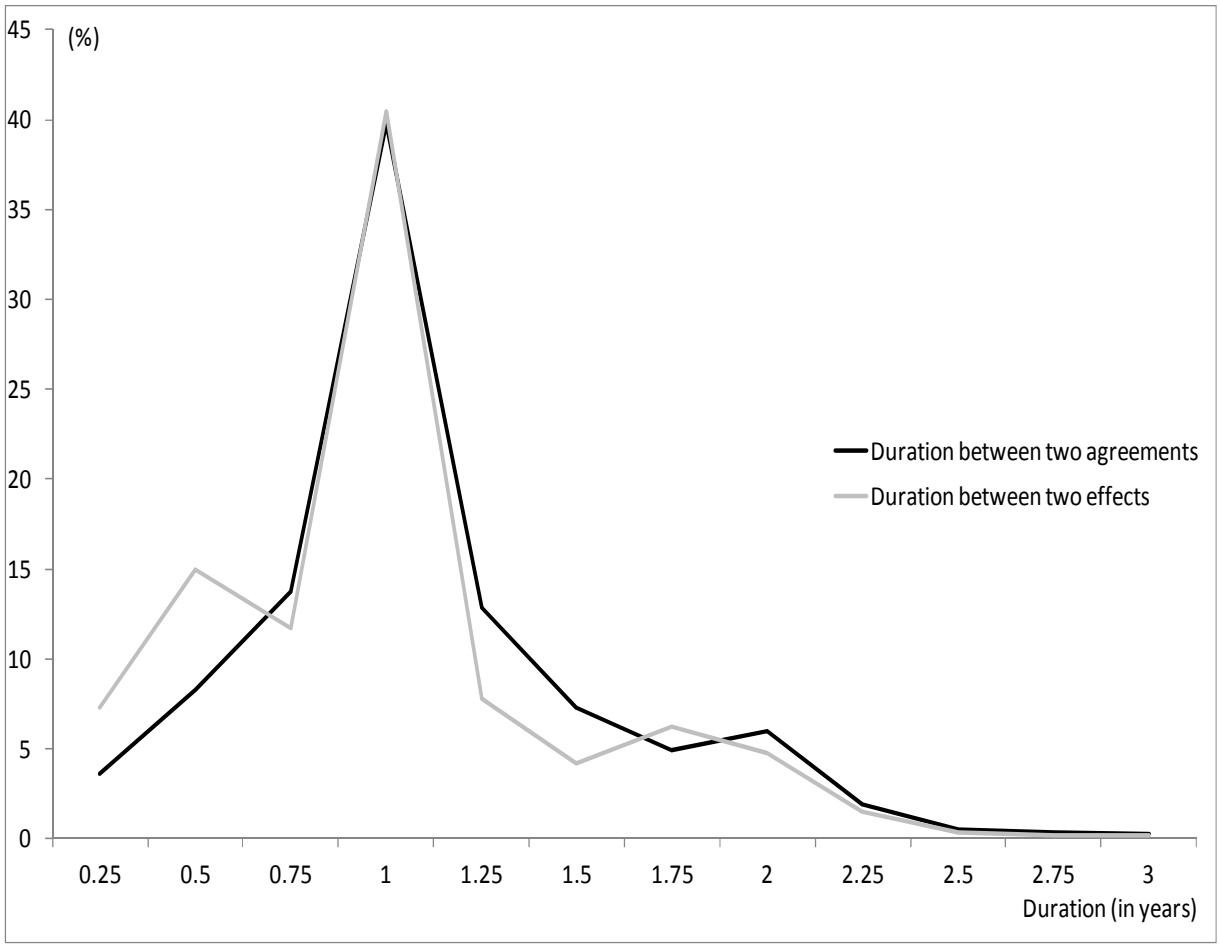

Notes: The light grey line is the weighted proportion of agreements that are signed in a given quarter and the black line is the same proportion but for agreement enforcement. We compute those statistics for three periods: 2007-2014, 2007-2010 where the NMW was usually adjusted in Q3 and 2010-2014 where the NMW was usually adjusted in Q1.

**Figure 5: Proportion of industries with at least a wage floor below the NMW over time**




Notes: the grey histogram (right axis) corresponds to NMW increases (in percentage).The dark solid line is the proportion of industries with at least one wage floor below the NMW (in percentage) calculated as the ratio of the total number of employees in non-conform industries over the total number of employees. The grey dashed line represents the proportion of industries (weighted by the number of employees) in which wage agreements come into effect at a given date (quarter-year).

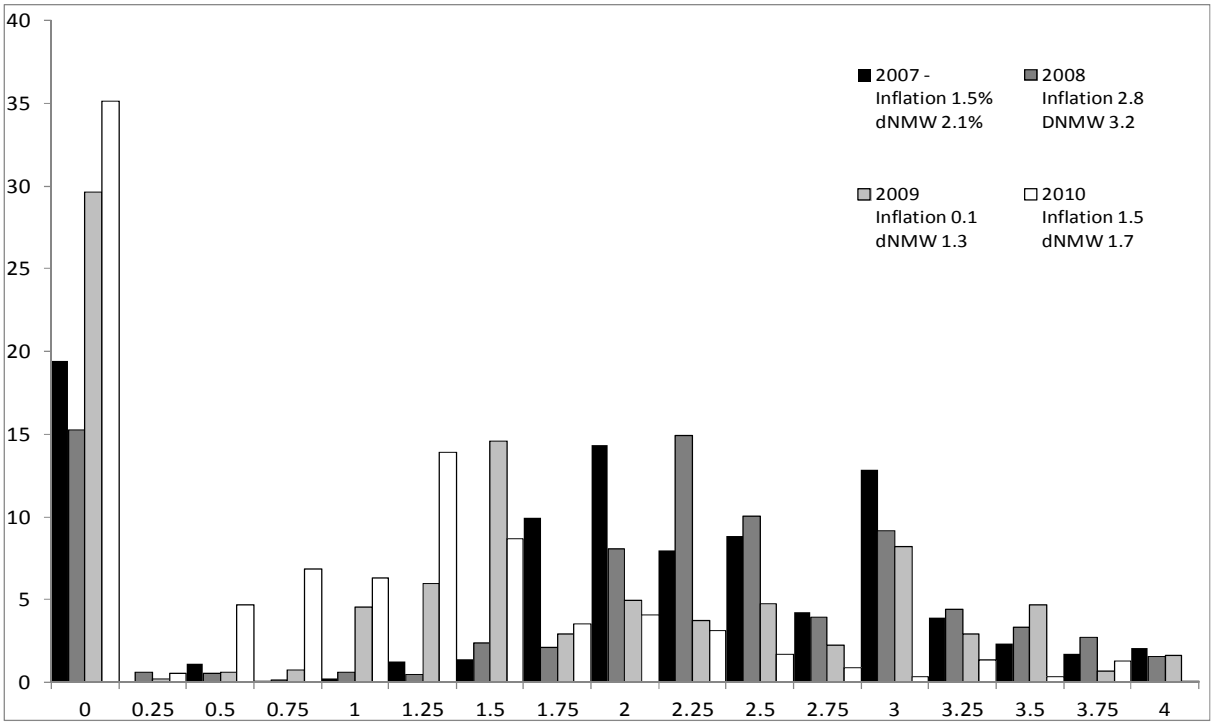
**Figure 6: Distribution of durations (in years) between two successive signing dates of wage agreements (or two dates of wage agreement enforcement)**



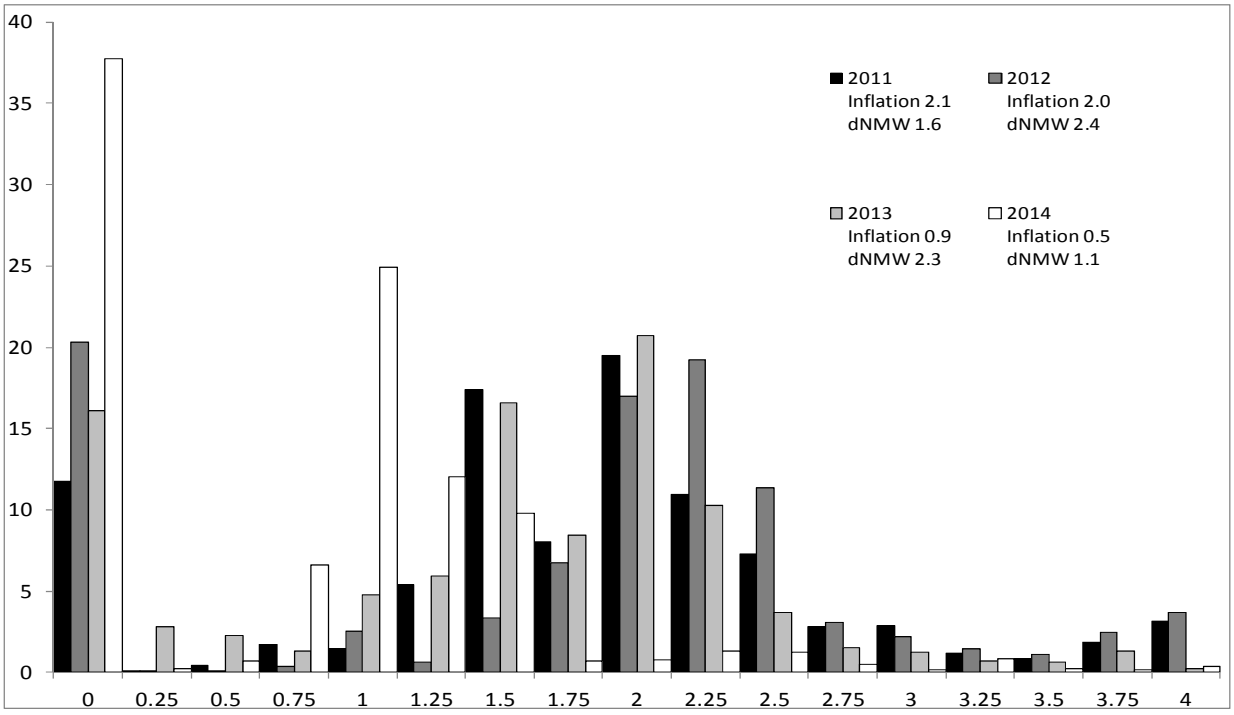

Notes: durations are computed as the difference between two successive signing dates of wage agreements (or two dates of agreement enforcement). All industries are considered over the period 2007-2014.

**Figure 7: Distribution of wage floors variations between two wage agreement enforcements**

**2007-2010**

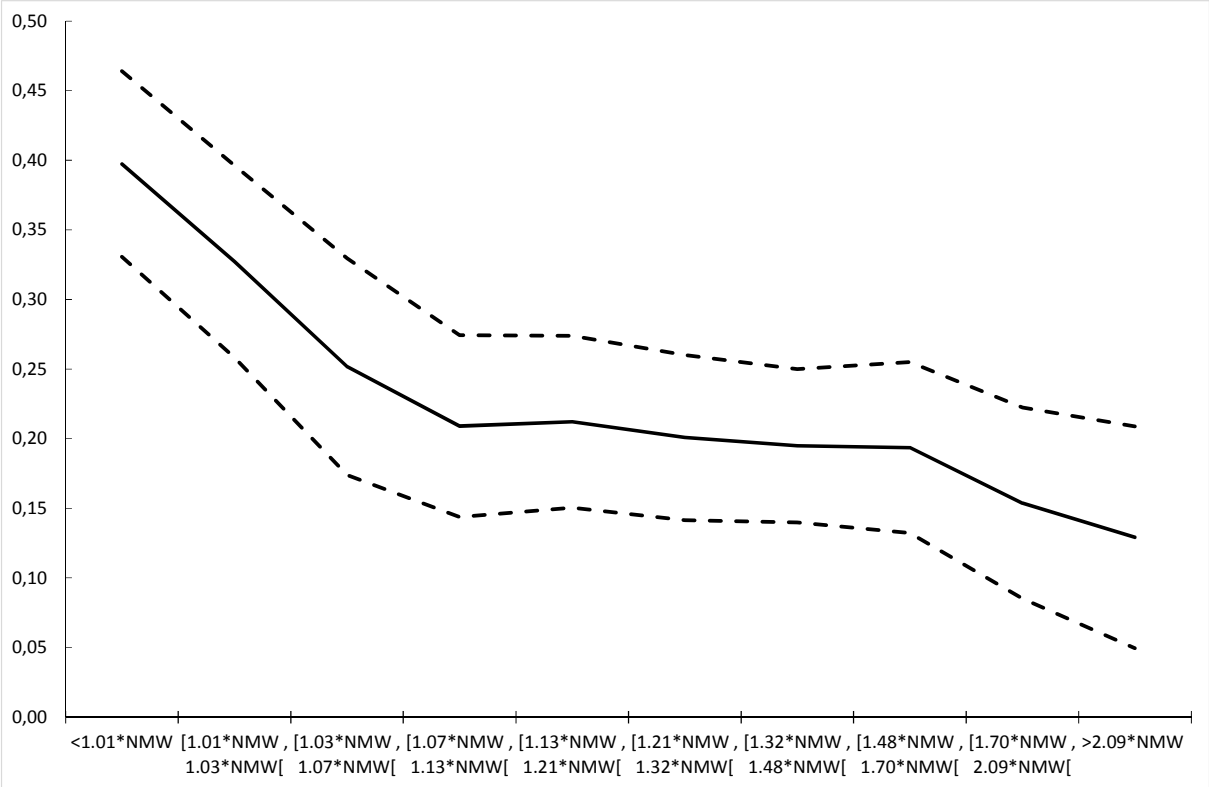



**2011-2014**




Notes: this figure plots the distribution of wage changes between two dates of industry-level agreement enforcements for all industries in our sample. Annual wage variations are calculated during the last quarter of a given year. Distributions are weighted by the number of employees.

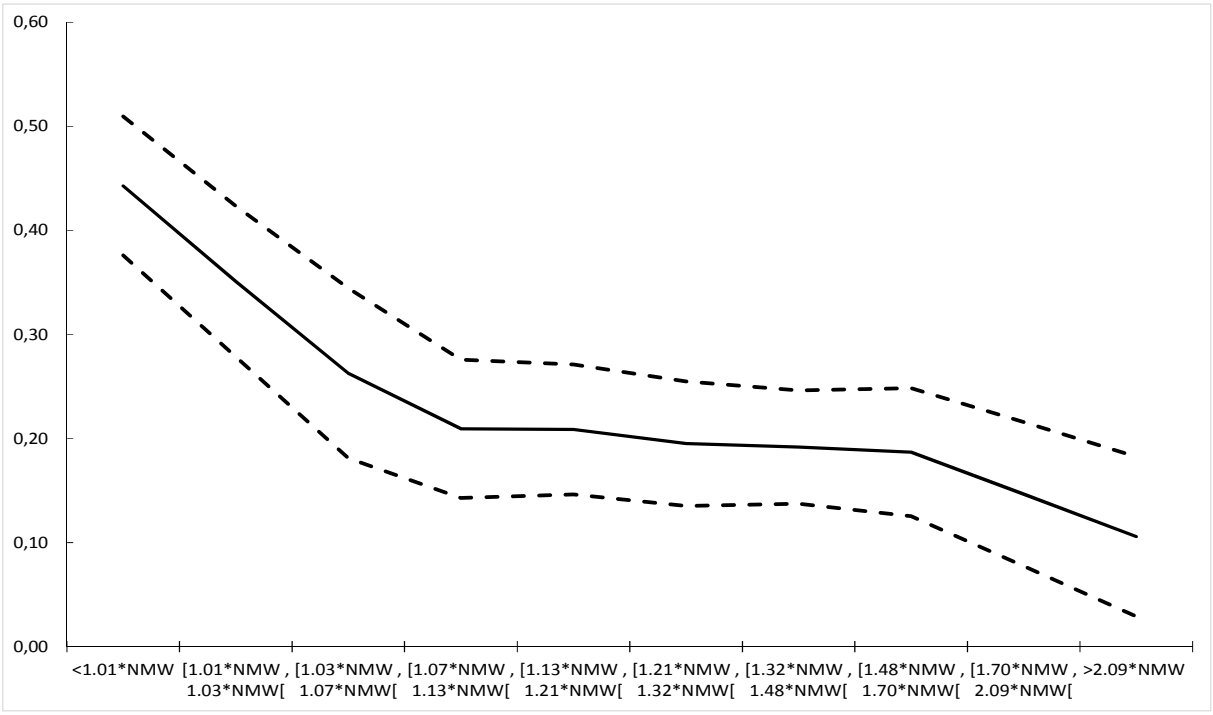
**Figure 8: Elasticity of wage floor increases with respect to the real NMW increases along the wage floor distribution**



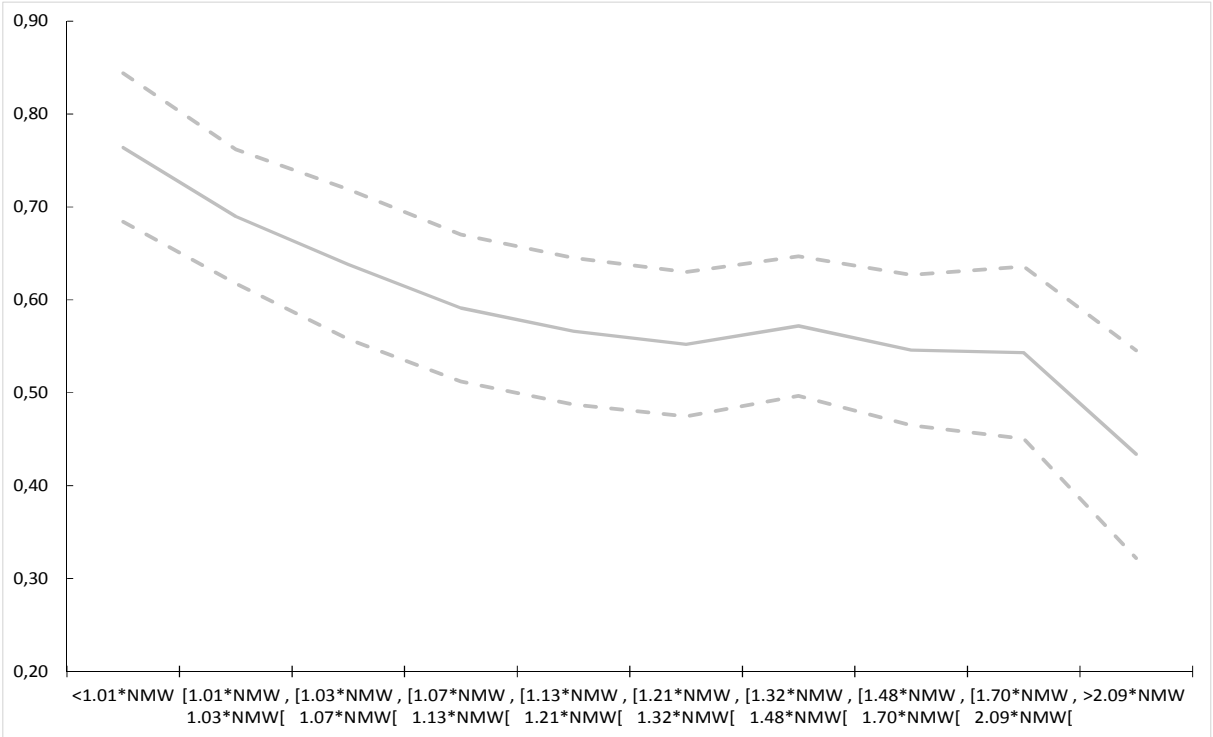

Notes: this figure reports parameter estimates obtained by adding to our baseline Tobit model interaction terms (dummy variables) which capture the relative position of a wage floor along the wage distribution. This relative position is calculated with reference to the NMW level. The black line reports elasticities of the nominal wage floors with respect to NMW increases (in real terms); the dashed lines represent the 95%-confidence interval.

**Figure 9: Elasticity of wage floor variations with respect to real NMW increases and with respect to inflation along the wage floor distribution**

a) Real NMW



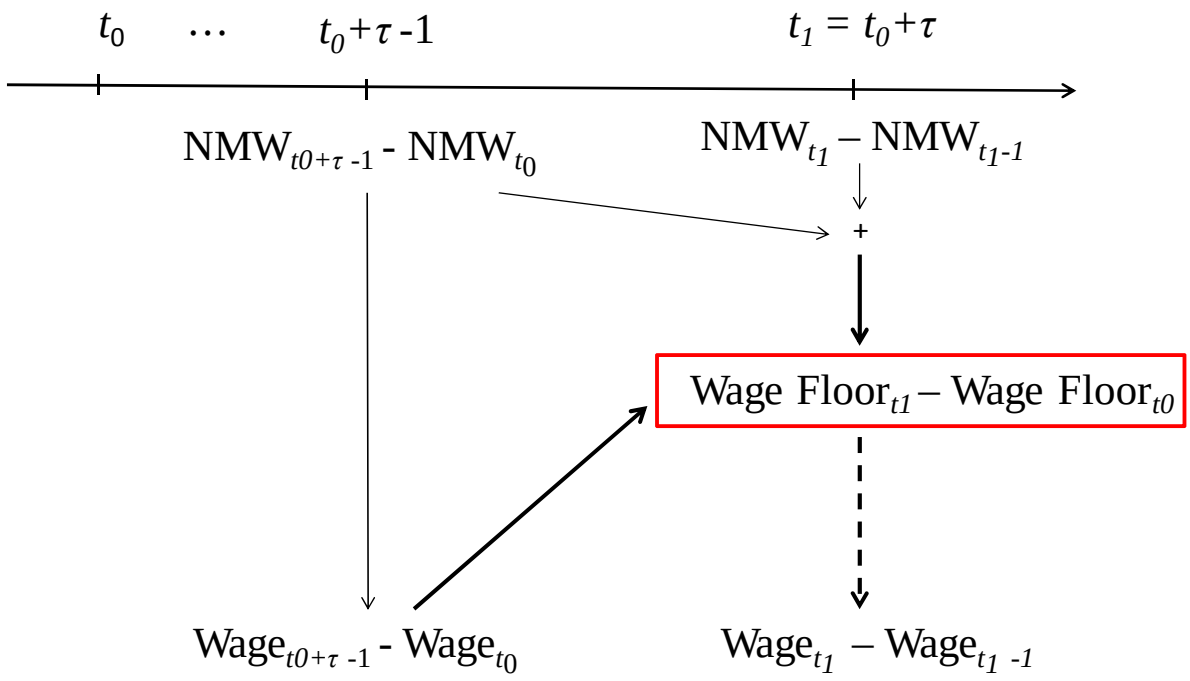

b) Inflation




Notes: this figure reports parameter estimates obtained by adding to our baseline Tobit model interaction terms (dummy variables) which capture the relative position of a wage floor along the wage distribution. This relative position is calculated with reference to the NMW level. The black line reports elasticities of the nominal wage floors with respect to NMW increases (in real terms). The grey lines report elasticities of nominal wage floors with respect to inflation. The dashed lines represent the 95%-confidence interval.

**APPENDIX (not intended to be published)**

**Figure A: Timing of wage floor adjustments**




2

Notes: t0 and t1 correspond to dates of wage agreements. “NMW” is the national minimum wage that can be changed at all dates. “Wage” corresponds to actual individual wages that can be adjusted by different factors, including NMW and wage floors. “Wage Floor” corresponds to wage floors that are adjusted at each wage agreement. They can impact actual wages and are impacted by past changes in actual wages in a given industry, but also by changes in the NMW level.

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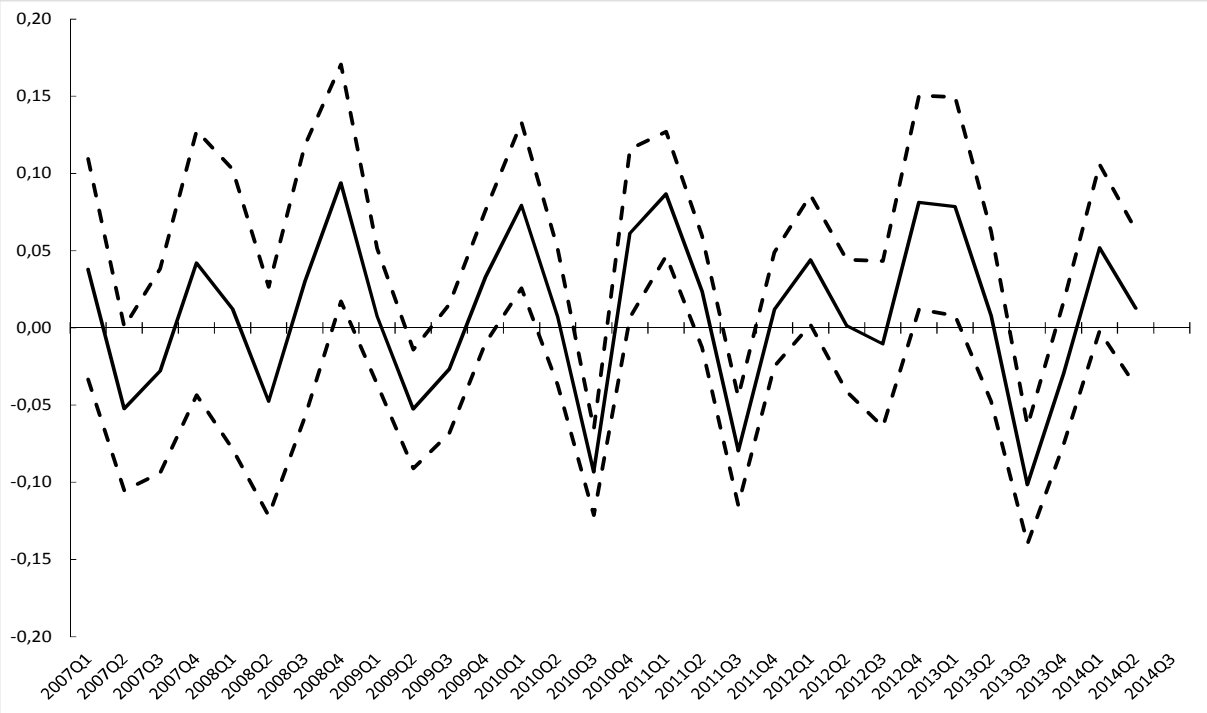
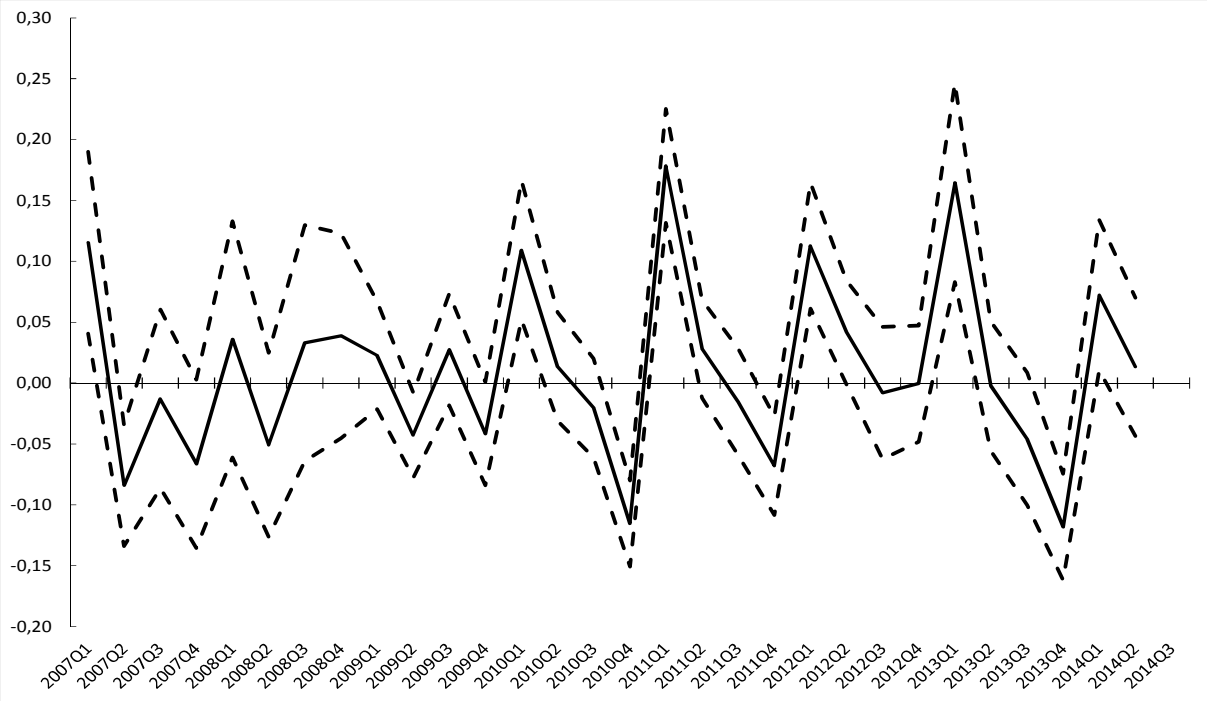
**Figure B: Estimates of time effects in Probit regressions using date controls:**

**a) Dates of wage agreement signing**



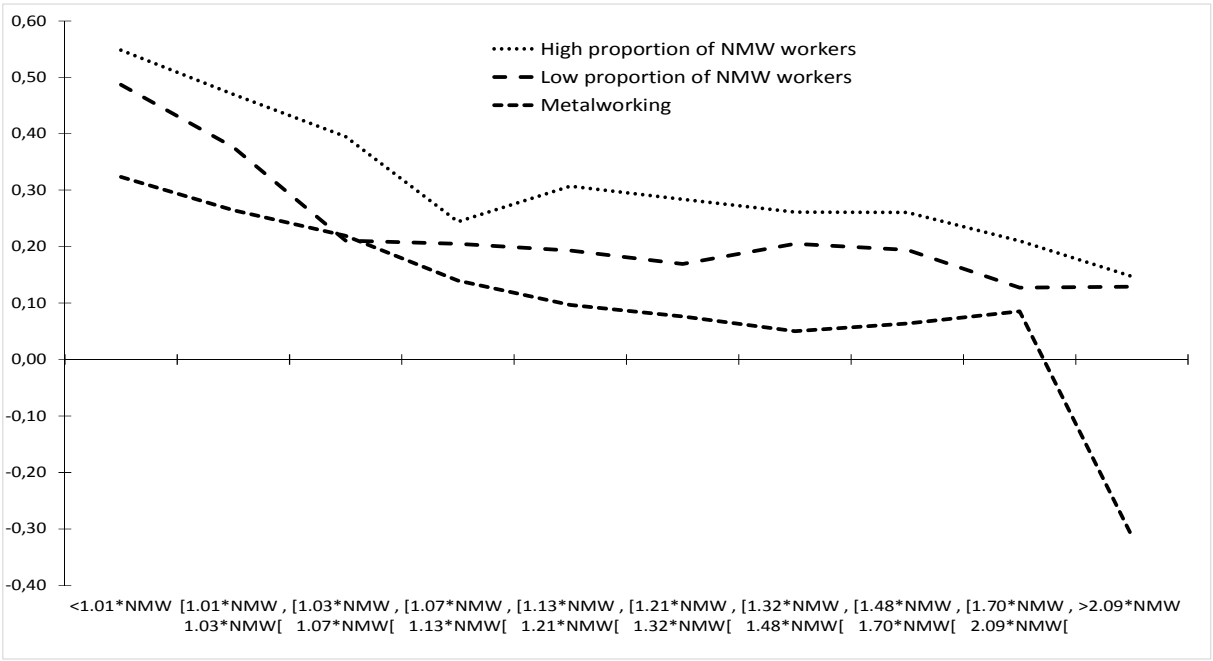

**b) Dates of wage agreement enforcement**



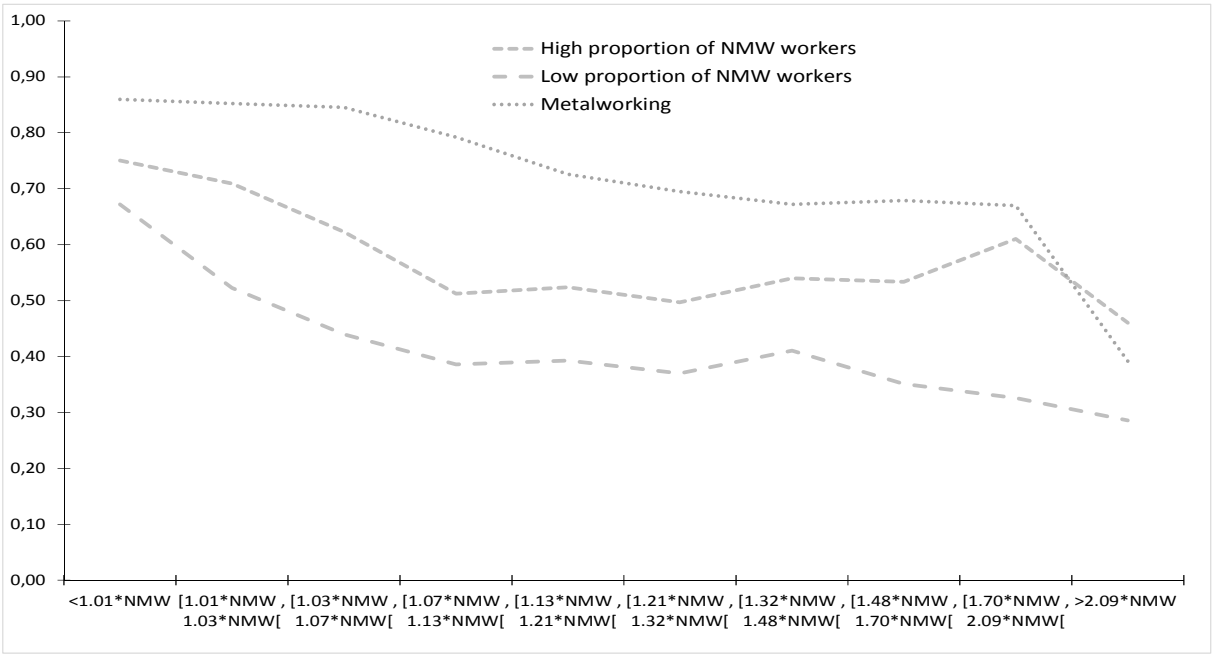

Notes: These figures report parameter estimates (black solid line) and 95%-confidence interval (black dashed lines) associated with date dummies used as time controls in the Probit regressions (equation 2). Q42014 is chosen as the reference quarter.

**Figure C: Elasticity of wage floor variations with respect to the real NMW increases and to inflation along the wage floor distribution (industry heterogeneity)**

a) Real NMW



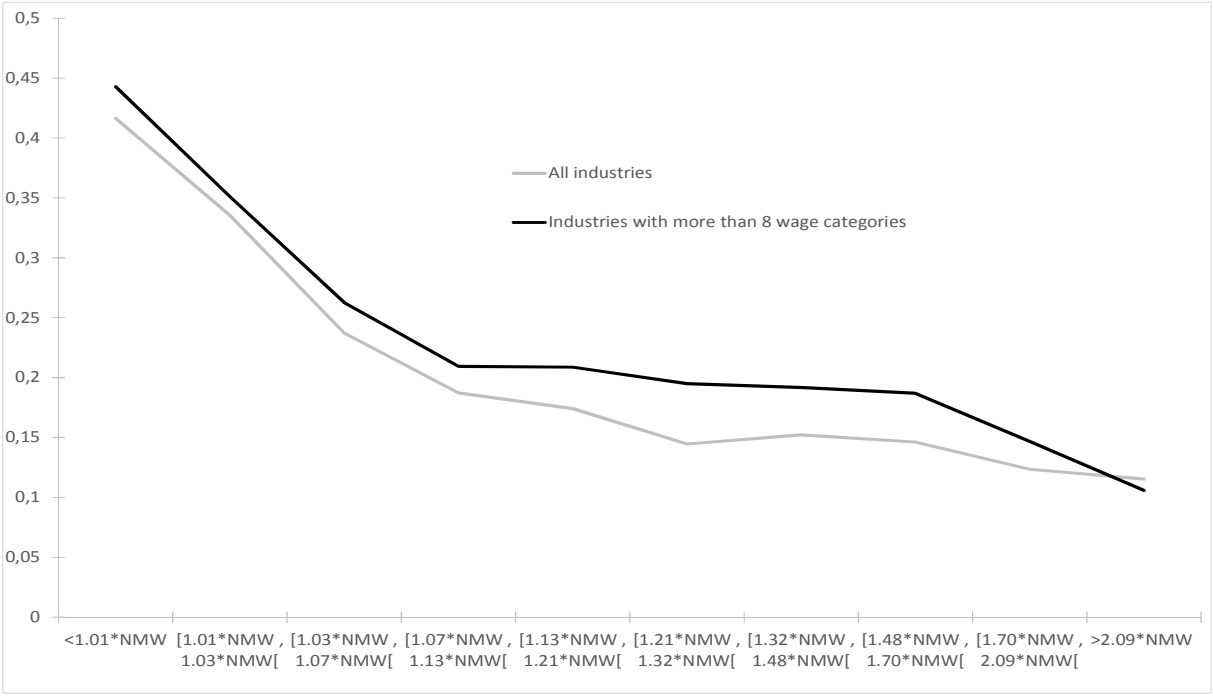

b) Inflation



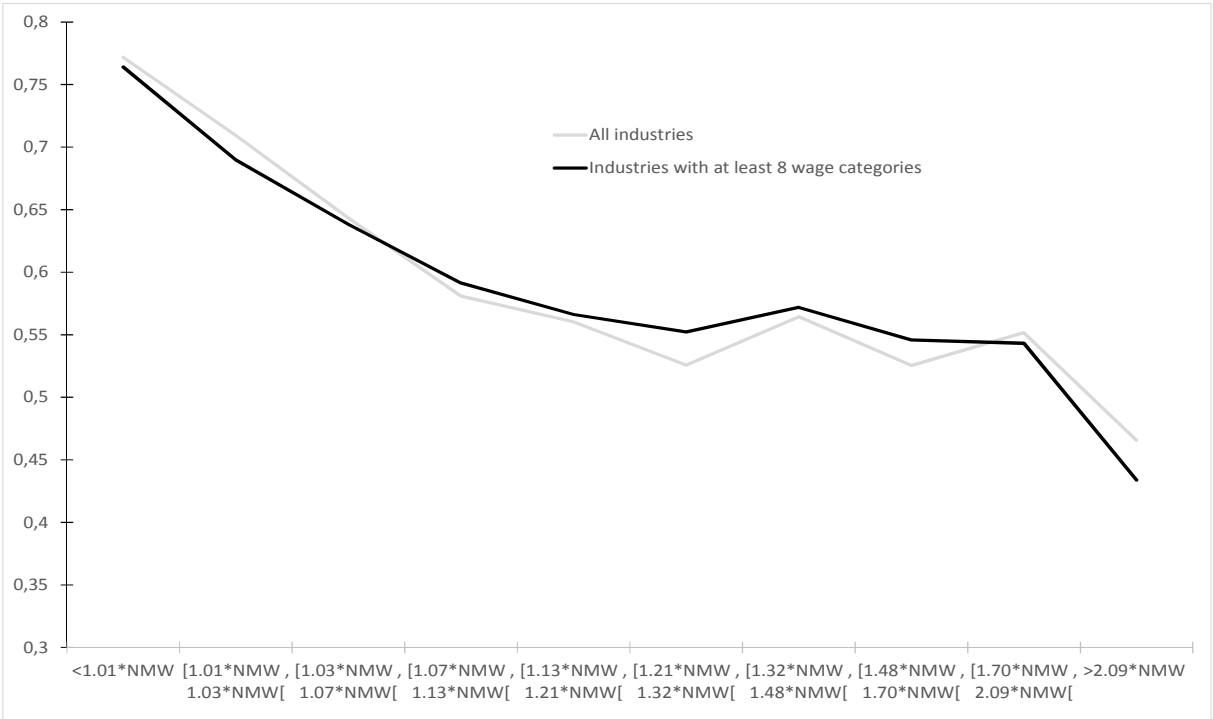

Notes: This figure reports parameter estimates obtained by adding to our baseline Tobit model interaction terms (dummy variables) which capture the relative position of a wage floor along the wage distribution (calculated with reference to the NMW level). The black line reports elasticities of the nominal wage floors with respect to NMW increases (in real terms). The grey lines report elasticities of nominal wage floors with respect to inflation. Estimates associated with the curve "High prop. of NMW workers" are based on the subsample of industries with a national coverage and with a proportion of minimum-wage workers higher than the median among all industries. Estimates associated with the curve "Low prop. of NMW workers" are based on the subsample of industries with a national coverage and with a proportion of minimum-wage workers smaller than the median among all industries. Estimates associated with the curve "Metalworking" are based on the subsample containing local metalworking industries.

**Figure D: Elasticity of wage floor variations with respect to the real NMW increases and to inflation along the wage floor distribution (industries with at least 8 wage categories versus all industries)**

a) Real NMW




b) Inflation




Notes: This figure reports parameter estimates obtained by adding to our baseline Tobit model interaction terms (dummy variables) which capture the relative position of a wage floor along the wage distribution. This relative position is calculated with reference to the NMW level. The black line reports elasticities of the nominal wage floors with respect to NMW increases (in real terms). The grey lines report elasticities of nominal wage floors with respect to inflation.

**Table A: Marginal effects of covariates in the Probit model for the wage agreement signing / enforcement (Industry heterogeneity)**

| | Signing | | | Enforcement | | |
|---|---|---|---|---|---|---|
| | National | | Metal-working | National | | Metal-working |
| | High prop. of min wage workers | Low prop. of min wage workers | | High prop. of min wage workers | Low prop. of min wage workers | |
| Cumulated inflation | 8.164*** (1.294) | 6.340*** (1.049) | 7.118*** (1.425) | 6.304*** (1.412) | 4.645*** (1.177) | 7.052*** (1.367) |
| Cumulated real NMW change | 3.576*** (1.082) | 2.108** (1.071) | 3.357*** (1.290) | 3.871** (1.715) | 0.359 (0.805) | 2.909*** (1.232) |
| Cum. real aggregate wage change | 8.644*** (2.726) | 5.864*** (1.882) | 9.353*** (3.182) | 6.551** (2.804) | 6.906*** (1.994) | 8.886*** (3.023) |
| Cum. real wage change in the industry | 1.962 (2.547) | -2.825 (2.381) | 2.313 (6.189) | -0.433 (2.423) | 1.450 (2.766) | 4.674 (6.469) |
| Local unemployment rate | 0.100 (0.107) | -0.026 (0.040) | 0.015 (0.30) | 0.022 (0.110) | -0.001 (0.039) | 0.029 (0.028) |
| Output gap | 0.436 (0.604) | 0.121 (0.628) | -0.140 (1.549) | 0.045 (0.605) | 1.229* (0.704) | 0.046 (1.594) |
| Duration | | | | | | |
| 6 months | -0.013 (0.017) | 0.010 (0.024) | -0.048* (0.026) | 0.051** (0.021) | 0.059** (0.027) | -0.043 (0.026) |
| 1 year | 0.222*** (0.030) | 0.324*** (0.022) | 0.288*** (0.026) | 0.251*** (0.032) | 0.345*** (0.026) | 0.301*** (0.029) |
| 2 years | 0.064 (0.055) | 0.220*** (0.046) | 0.070 (0.064) | 0.096* (0.059) | 0.181*** (0.048) | 0.067 (0.070) |
| ***Before 2010*** | | | | | | |
| Non-compliance with the NMW | 0.018 (0.019) | 0.008 (0.015) | 0.089 (0.055) | 0.038* (0.023) | 0.050** (0.018) | 0.080 (0.050) |
| ***After 2010*** | | | | | | |
| Non-compliance with the NMW | 0.033*** (0.012) | 0.027* (0.015) | 0.116*** (0.020) | 0.068*** (0.014) | 0.057*** (0.016) | 0.126*** (0.019) |
| N. of obs. | 2984 | 3169 | 2291 | 2984 | 3169 | 2291 |

This table reports estimated marginal effects for Probit models. Standard errors are obtained using bootstrap methods and are reported in brackets. The dependent variable is the dummy variable equal to 1 if there is a wage agreement in industry *j* at date *t* (quarter-year). Estimates in the column "High prop. of NMW workers" are obtained for the subsample of industries with a national coverage and with a proportion of minimum-wage workers higher than the median among all industries. Estimates in the column "Low prop. of NMW workers" are obtained for the subsample of industries with a national coverage and with a proportion of minimum-wage workers smaller than the median among all industries. Estimates in the column "Metalworking" are obtained for the subsample containing local metalworking industries. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.1

**Table B: Parameter estimates of the Tobit model – Wage floor changes – Before / after 2010**

| *Dependent variable :* Nominal wage floor changes | | | | | |
|---|---|---|---|---|---|
| | | All | High prop. of min. wage workers | Low prop. of min. wage workers | Metalworking |
| **Before 2010** | Cumulated inflation | 0.579*** (0.051) | 0.570*** (0.072) | 0.367*** (0.109) | 0.724*** (0.086) |
| | Cumulated real NMW change | 0.213*** (0.035) | 0.350*** (0.078) | 0.200*** (0.067) | 0.173*** (0.058) |
| | Cum. real aggregate wage change | 0.204*** (0.075) | 0.122 (0.098) | 0.290* (0.170) | 0.273 (0.182) |
| | Cum. real wage change in the industry | 0.609*** (0.196) | -0.170 (0.174) | 0.907*** (0.246) | 1.903*** (0.670) |
| **After 2010** | Cumulated inflation | 0.592*** (0.038) | 0.557*** (0.067) | 0.471*** (0.062) | 0.769*** (0.093) |
| | Cumulated real NMW change | 0.256*** (0.041) | 0.233*** (0.076) | 0.282*** (0.083) | 0.200*** (0.077) |
| | Cum. real aggregate wage change | 0.164** (0.066) | 0.236* (0.123) | -0.041 (0.119) | 0.036 (0.190) |
| | Cum. real wage change in the industry | 0.107 (0.097) | -0.082 (0.167) | -0.022 (0.137) | 0.141 (0.331) |
| | Local unemployment rate | 0.001 (0.001) | 0.012*** (0.004) | 0.006 (0.005) | 0.001 (0.001) |
| | Output gap | 0.015 (0.015) | -0.029 (0.022) | -0.047 (0.033) | -0.012 (0.048) |
| | Mills Ratio | -0.002*** (0.000) | -0.003*** (0.001) | -0.004*** (0.001) | 0.000 (0.001) |
| | $R^2$ | 0.599 | 0.547 | 0.611 | 0.667 |
| | N | 17,064 | 5,460 | 4,337 | 4,637 |
| | Time dummies | Date | Date | Date | Date |
| | Industry dummies | Y | Yes | Yes | Yes |

Note: The dependent variable is the nominal (or real) wage floor change between two effects of wage agreements in a given industry. Estimates in the column "High prop. of NMW workers" are based on the subsample of industries with a national coverage and with a proportion of minimum-wage workers higher than the median among all industries. Estimates in the column "Low prop of NMW workers" are based on the subsample of industries with a national coverage and with a proportion of minimum-wage workers smaller than the median among all industries. Estimates in the column "Metalworking" are based on the subsample containing local metalworking industries. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

**Table C: Parameter estimates of the Tobit model – Wage floor changes – Large vs small firms**

| *Dependent variable :* Nominal wage floor changes | High share of large firms | Low share of large firms | High share of small firms | Low share of small firms |
|---|---|---|---|---|
| Cumulated inflation | 0.650*** (0.058) | 0.549*** (0.047) | 0.506*** (0.049) | 0.683*** (0.051) |
| Cumulated real NMW change | 0.253*** (0.040) | 0.212*** (0.037) | 0.202*** (0.047) | 0.235*** (0.033) |
| Cumulated real aggregate wage change | 0.180*** (0.079) | 0.138** (0.064) | 0.222*** (0.071) | 0.092 (0.071) |
| Cumulated real wage change in the industry | 0.123 (0.173) | 0.435*** (0.153) | 0.438*** (0.170) | 0.174 (0.129) |
| Local unemployment rate | 0.000 (0.001) | 0.012*** (0.004) | 0.000 (0.001) | 0.001 (0.001) |
| Output gap | 0.034 (0.027) | -0.005 (0.020) | -0.004 (0.025) | 0.029 (0.020) |
| Mills Ratio | -0.001** (0.001) | 0.001 (0.001) | -0.003*** (0.001) | -0.001 (0.001) |
| $R^2$ | 0.677 | 0.538 | 0.557 | 0.651 |
| N | 7,050 | 10,014 | 8,385 | 8,679 |
| Time dummies | Date | Date | Date | Date |
| Industry dummies | Yes | Yes | Yes | Yes |

Note: The dependent variable is the nominal (or real) wage floor change between two effects of wage agreements in a given industry. Estimates in the column "High share of large firms" (resp., low share) are for industries in which the share of firms with more than 500 employees is above (resp. below) the median (0.25%). Estimates in the column "High share of small firms" (resp., low share) are for industries in which the share of firms with less than 10 employees is above (resp., below) the median (69%). Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

**Table D: Variance decomposition of annual wage floor growth within industries and across industries**

| | $R^2$ of cross sectional regressions of year-on-year wage floor growth on industry fixed effects |
|---|---|
| 2007 | 0.70 |
| 2008 | 0.66 |
| 2009 | 0.75 |
| 2010 | 0.82 |
| 2011 | 0.88 |
| 2012 | 0.70 |
| 2013 | 0.78 |
| 2014 | 0.77 |

Note: Reported R-squared are obtained by regressing, for each year of our sample, year-on-year wage floor growth on industry fixed effects. It measures variance of annual wage growth explained by industry-specific difference. The remaining variance is explained by differences in annual wage growth across occupations within the same industry.